

The Boston Medical and Surgical Journal

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April 13, 1922

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Original Articles.

MODIFICATIONS OF APPARATUS AND IMPROVED TECHNIC ADAPTABLE TO THE BENEDICT TYPE OF RESPIRATION APPARATUS.

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PAPER III.

GRAPHIC METHOD FOR THE ESTIMATION OF THE METABOLIC RATE.

THE kymograph has always been a very adaptable and valuable adjunct to the Benedict type of respiration apparatus for the study of the respiratory exchange and in the determination of the metabolic rate. Though quite indispensable with the original Benedict, "the Universal," the systematic use of the kymograph with the "Portable" has not been insisted upon because the metabolic rate can be deter-

mined without it. However, its use has been recommended for making additional observations or as a means to reveal and record various conditions pertaining to the apparatus and the behavior of the subject during a test. Dr. F. G. Benedict has recently called my attention to the fact that the fundamental point elaborated in this paper is outlined in his description of "*Ein Universalrespirationsapparat*."

The purpose of this paper is not only to emphasize the value of the kymograph for such purposes as just mentioned, but to show, also, that a kymograph record of the movements of the spirometer bell taken during a respiration test, simultaneously with a graphic time record, as shown in Figure 1, is not only very practical but that it is the most accurate basis for the measurement of the oxygen consumption of the subject with this type of apparatus. In fact, if properly taken, such a graph is nothing less than a most accurate record of the changes in the position of the spirometer bell during an observation period. It can be measured much more easily and accurately directly on this record, than is now customary from readings indicated by the moving pointer against the millimeter scale. Every operator must admit that while the "catching" of a reading is relatively easy with subjects who breathe regularly, it is often difficult and of questionable

accuracy in irregular respiration. It is for the purpose of minimizing such unavoidable errors that it has been deemed advisable to take three successive readings, both at the start and at the end of a test, and average the three distinct periods thereby constituted.

Even more elaborate precautions are, for justifiable reasons, now advised in a suggestion that the start and the end readings for each period be obtained from the average of ten consecutive readings.

The graphic method does better still, and all in the simple operation of drawing a line along the lower border of the respiration curve which gradually ascends as the bell descends during the test period. This line may properly be designated as the "oxygen consumption line" or, briefly, the "O. line." (See Fig. 1.) The rise of this line, in a given number of minutes, also graphically recorded below the respiration curve, represents accurately the distance the bell has fallen during that time. This simple measurement is illustrated in Figure 1 (4), and is done at leisure after the record has been removed from the kymograph drum.

Technical difficulties are in this manner successfully avoided, besides securing in this kymographic tracing a trustworthy and significant record of certain conditions under which the test is effected. No disturbance of more than a trifling nature can occur to the subject while he is under observation, without affecting the respiration in a way readily detected from the tracing. Not infrequently, also, the test is started before the patient has returned to the basal conditions which the 30-minute preliminary rest period is intended to insure, but which are always more or less disturbed in the process of starting the test. If, as a result, the metabolic rate has been temporarily increased, the respiration curve will readily show it, and any portion of the tracing which does not represent the probable basal metabolic rate of the subject can be disregarded in the measurements. See Figure 1 (1, 2, 4). It is better to base the calculations on a short, undisturbed period of only four or five minutes than on a longer one which includes vitiated sections. I observed this years ago when using Benedict's Universal Apparatus, in which a very delicate meter is used to measure the oxygen consumed. Kymographic tracings were invariably taken, also, and afforded the opportunity to compare the results. This was done in every test, and not infrequently, for the reasons above given, more reliance could be placed on the measurement based on a selected portion of the tracings than on the meter readings for the entire test period. The two methods, however, agreed remarkably well, as a rule, when the tracings showed no disturbance throughout the test. On account of even slight disturbing factors,

the most important of which is the consciousness of the subject of his own respiration, often intensified by his effort to breathe correctly, the degree of expansion of the lungs even at the end of expiration may vary considerably. This degree of expansion may vary rapidly and repeatedly as shown in tracings 1a, 2a and 2b, or, as fairly well shown at the end of tracing 1a and at the beginning of tracing 3a, the change of degree of expansion may be maintained and be quite constant for one or two minutes, or perhaps longer. It is evident that this possible source of error, which will generally be revealed by the kymograph, will otherwise pass undetected and introduce an error which may easily amount to 10 per cent. or even more.

Figure 1 illustrates the advantages of the graphic method in various forms of respiration, of which there are three, based on the regularity of the respiratory movements.

1. Regular respiration: Tracings (1b and 4).
2. Irregular respiration: Tracings (1a, 2a and 2b).
3. Rhythmically irregular respiration: Tracings (3a and 3b—which is a typical "Cheyne-Stokes").

Regular respiration in clinical cases is the exception rather than the rule. Therefore it is often difficult to pick out an average normal expiration at the end of which a reading should be taken.

Figure 2 shows a most practical and simple outfit in which a kymograph with timing device is adapted to a "Modified Benedict with Valves," described in Paper I, April 6, 1922. The accessories required are usually found in most laboratories. The equipment need not be expensive, though much money can be spent on a more elaborate kymograph or tracing and timing devices. I prefer to make the records with ink rather than on smoked paper, though the latter has the advantage of taking tracings with the simplest kind of marker. The graphic method is invaluable in experimental research, as, for instance, in the study of the effect upon the metabolic rate of various physio-therapeutic or medicinal agents, especially when the effects occur within a short period of time. Changes in the metabolic rate are easily detected and measured from the tracing, especially when trained subjects are used.

Advantages of the graphic method. It simplifies the technic. It reduces to a minimum the necessary procedures. There are no spirometer readings to be made. Stop-watches can be dispensed with entirely. The kymograph automatically records the time, the oxygen consumption and, to a large extent as well, the working condition of the apparatus and the behavior of the subject. The average respiration

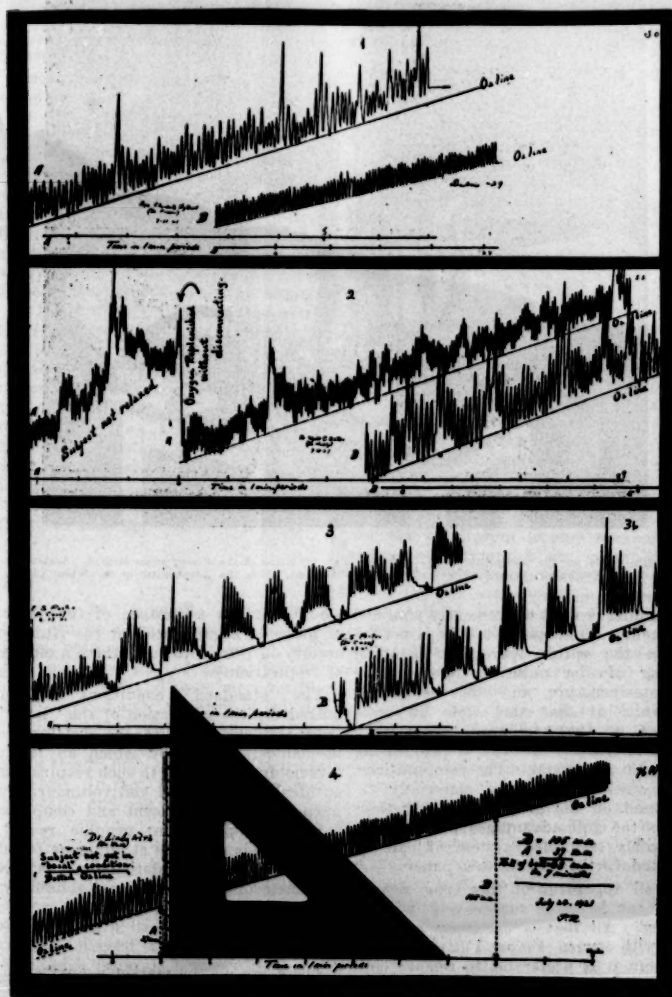


FIG. 1.—Illustrating types of respiration, locating the "O₂ consumption line," and measuring its rise in a recorded number of minutes for estimating the rate of oxygen consumption.

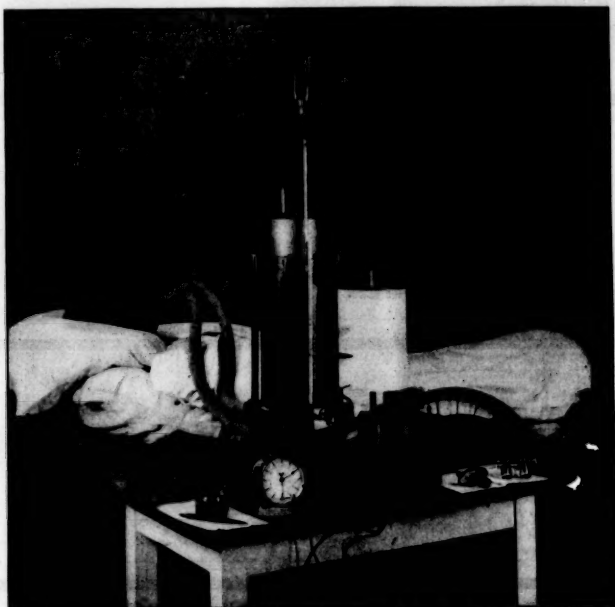


FIG. 2.—Complete Outfit for the Estimation of the Metabolic Rate by Means of the Kymographic Method. Adapted to the Benedict type of Respiration Apparatus (Roth "Valve" Modification). Note the Adaptability of the Wheel Chair.

count per minute is most conveniently obtained from the tracing. One operator only is needed to supervise the entire operation, including the counting of the pulse, to observe the spirometer temperature and the barometric pressure, while at the same time an occasional glance at the kymograph keeps him informed as to whether the test is progressing under desirable conditions. The computations, as ordinarily carried on, are materially reduced if based on the graph which, furthermore, allows the full advantages presented in the considerably simplified system of calculation suggested further on in this paper.

As with all apparatus of this type, several observations can be made successively, without disconnecting. All that is necessary is to refill the bell with oxygen, Figure 1 (2). In some cases, however, it is preferable to remove both the nose-clip and the mouthpiece and allow the patient to "rest a bit," or "take a breath," to insure continued relaxation.

Aside from the specific application of the graphic record to the measurement of the metabolic rate, the study of the respiration curve should prove to be in itself of clinical interest. This has been shown by Dr. David L. Edsall,

who has taken advantage of the great wealth of material accumulated at the Nutrition Laboratory in Boston to make there a clinical study of respiration.²

The "standard" conditions uniformly required for the estimation of the "basal" metabolic rate and, likewise, the absolutely uniform mechanical process by which all tracings are invariably taken, give to such respiration curves an ideal mathematical and volumetric value for purposes of measurement and comparison.

Lastly, a permanent graphic record is obtained and is available at any time for checking the results and calculations. It is, besides, a certificate of the quality and reliability of the operator's technic.

The Kymograph.

There are on the market a number of kymographs which answer the purpose very nicely. The tracings shown in Figure 1 were taken with a kymograph,³ the drum of which takes a sheet of paper 15-17 cm. wide. While it is possible, as before stated, to obtain very accurate results from calculations based on a selected four- or five-minute portion of a tracing, the latter should cover a longer period from which

to select the best portion obtained unless, as may often happen, the entire tracing is good. Everything considered, and for a specific reason yet to be mentioned, the best practice is to continue the test long enough to obtain, if possible, a tracing from which a satisfactory portion of at least six-minutes duration can be selected. For this purpose, a taller drum taking a wider paper (20-22 cm.) is preferable. The one shown in Figure 2 was obtained by simply fitting a 22 cm. sleeve made of tin, over the drum. The wider paper makes it possible to obtain a tracing of the desirable uninterrupted length without running the risk of having the tracing pen rise and be caught beyond the limits of the writing surface, as may happen in cases with an excessive oxygen consumption or when the subject happens to take an unusually deep breath.

It is important that the drum be securely mounted on its shaft. Guard also against the possibility of the paper slipping on the drum while the tracing is being taken. No matter how snugly the paper may have been mounted, it may slip unless the extra precaution is taken to fasten it to the drum at some convenient point, with a bit of wax, gum, adhesive, or a clip. Each sheet of paper will hold at least two or three tracings if they are recorded as shown in Figure 1.

The best speed at which the drum should revolve is about 40 mm. per minute and must be regular.

Tracing Pen.*

Figure 2 shows how a small "vest pocket" fountain pen can be attached to the binding-post which has been mounted for such a purpose on the counter-weight of the spirometer bell. The pen may feed and trace more readily with the back of the point. A drop of ink deposited with a dropper directly on the pen-point at the beginning of each tracing, will better insure a steady flow, whether the pen has been filled or not. In fact, the pen can be used without the barrel and ink reservoir.

Time Record.

An ink tracer similar to the one just referred to is adaptable for recording time in one-minute periods on the line which it traces and which also serves as a base-line for measurements. The time record, though traceable by hand, as explained below, is best recorded automatically by mounting the tracer on an electro-magnet actuated by one or two dry cells and connected with a timepiece which makes an electric contact once a minute. If it unexpectedly fails to work (using any well-regulated timepiece with a second hand, or a stop-watch), the time can be recorded by hand, by gently tapping the tracer on the even minute

after the respiration tracing has been well started, again exactly one minute later, and once more in six minutes, or at any time, on the exact minute, before terminating the test. If the kymograph is known to run at a uniform speed throughout a test, the missing markings which may be needed can easily be located later by measurement and the total time checked accurately from the one-minute space. An alarm clock, with a small second hand made to come in contact with a delicate spring properly insulated from the clock itself, can be made to give creditable service. More elaborate electric timing clocks are obtainable from laboratory apparatus supply houses.⁵ Whatever the device, it is worse than useless if it is not dependable.

Technic.

Except for the substitution of the graphic method instead of taking series of spirometer readings and timing periods with a watch, the technic is fundamentally the same as that described in Paper II. As soon as the patient has been "connected" and the spirometer bell is in motion, the kymograph is started and the respiration and time tracers are set in operation. The spirometer temperature is recorded, the pulse rate observed and recorded at intervals. The barometric pressure is noted. The test is continued until the operator is satisfied that from the respiration tracing obtained a satisfactory, uninterrupted section of exactly six minutes' duration (one-tenth of an hour) can be selected for subsequent measurement. The temperature of the spirometer chamber is again recorded. Before terminating the test, however, a graphic proof of the presence or absence of a leak during each period can now be obtained in addition, by the simple method advocated by Benedict,⁶ and which consists in placing a weight (40-50 gms.) on the spirometer bell, after a suitable tracing has been obtained, continuing operations a few minutes longer. Obviously, if there is a leak, the added weight will readily increase it and put it in evidence by a sharper rise of the O_2 line, whereas in the absence of a leak, the O_2 lines, before and after adding the weight, will both have the same angle with the base line.

CALCULATIONS.

This phase of the subject should be dealt with in short order merely by giving one or two samples of calculations which anyone could follow without having even the slightest conception of the fundamental principles involved. Such a blind process inevitably leads, sooner or later, to serious mischief. The following presentation is by no means exhaustive, but is chiefly intended to help lay the foundation for intelligent work.

The ultimate object in the calculations is to determine the percentage increase or decrease of the metabolic rate of the subject above or below the established normal average standards. These standards are expressed in terms of calories, per square meter of body surface per hour, or per twenty-four hours. The calories elaborated by the subject are calculated from the amount of oxygen he has absorbed during the test (1000 cc. of oxygen absorbed = 4.825 cal. See par. e below). The oxygen consumption is determined from the change in the position of the spirometer bell, which may be expressed directly in cubic centimeters but which, for the scheme of calculation here described, is best given in millimeters. Each millimeter of the fall of the bell during a test represents a definite amount of oxygen absorbed or its equivalent value in calories. This would, of course, vary according to the size of the bell. To shorten the process of calculation, not only is the selection of a section of tracing of one-tenth of an hour (6 minutes) recommended, but the apparatus is regularly supplied with a spirometer bell with a volume of 20.73 cc. per mm. of its height. With a bell of this size, each mm. of the fall of the bell, or rise of the O_2 line, in a six-minute period, represents exactly one calorie per hour. 1 mm. in 6 min. = 20.73 cc. O_2 = 207.3 cc., or .2073 liter per hour. $.2073 \times 4.825 = 1$ cal. per hour.

The necessary correction for temperature

and pressure is introduced next in the calculations, as will be explained. Before applying this formula, let us make a brief survey of all the items to be gathered in a routine test, omitting those which do not enter in the computations:

Name of subject, sex, age, height, net weight. (a) *Body surface* based on the height and weight. (See Carpenter, p. 108, Table 18. See also p. 11 for use.)

(b) The "Average Temperature" and (c) the "Temperature Increase" are noted from the readings of the spirometer bell thermometer, at the beginning and at the end of a period. With the valve apparatus a change of temperature, during a period of usual length of time, seldom if ever occurs. At any rate, a rise of less than one 1° C. can be ignored in the calculations, but if a rise of 1° C. or more is noted, allowance is readily made for it by adding for each degree C. of rise of temperature, .5 mm. to the total mm. rise of the O_2 line in six minutes. This correction is identical to that applied for the same purpose, but in a different manner, fully explained by Benedict in his method of calculation.

(d) *The Rise in mm. of the O_2 line* in a selected six-minute portion of a respiration tracing or, if the kymograph is not used, *the Fall in mm. of the spirometer bell* observed on the mm. scale during a period timed in the usual way with a stop-watch.

TABLE 1.

Factors for reducing Volumes to 0 C. and 760 mm

Formula: $\frac{273 + t}{273 + 0} \times \frac{760}{P}$

Bar. press. in mm.	Temperature in degrees Centigrade																							
N.M.	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35			
600	768	745	745	741	738	735	732	721	728	726	724	722	719	715	714	711	709	707	705	702	700			
605	755	731	749	747	743	740	737	734	732	730	727	725	722	720	717	715	712	710	707	705				
610	743	737	755	753	751	748	744	744	743	739	736	733	730	728	726	723	721	719	717	714	712			
615	737	744	763	759	757	754	752	750	747	744	742	739	736	734	731	729	726	724	722	720	718			
620	733	770	768	765	762	760	756	753	750	747	745	742	740	737	735	732	730	728	726	724	722			
625	729	774	776	771	769	766	764	762	759	756	754	751	749	746	743	741	738	736	734	732	730			
630	726	784	782	780	778	775	772	770	768	765	762	760	757	754	752	749	747	744	742	740	738	736		
635	722	788	786	784	781	778	776	774	771	768	766	763	760	757	755	753	750	748	746	744	742	740		
640	718	790	788	786	783	780	778	776	774	771	769	766	764	761	759	756	754	752	750	748	746	744		
645	714	804	801	799	796	793	791	788	786	783	780	777	775	772	770	768	765	762	760	758	755	753		
650	711	807	804	802	799	797	794	792	789	786	784	781	778	775	773	770	768	765	764	761	759	756		
655	717	814	811	808	805	803	800	798	795	792	790	787	784	782	779	776	774	772	770	767	764	762		
660	723	820	817	814	811	809	806	804	801	798	796	793	790	788	785	782	780	778	776	773	770	768		
665	729	826	823	820	817	815	812	810	807	804	802	799	796	794	791	788	786	784	782	779	776	774		
670	735	832	829	826	823	821	818	816	813	810	807	804	802	800	797	794	792	790	787	784	782	780		
675	741	839	836	833	830	827	825	822	819	816	814	811	809	806	803	800	798	796	793	790	787	785		
680	748	845	843	840	837	834	831	828	825	822	820	817	815	812	809	806	804	801	798	796	793	791		
685	754	851	848	846	843	840	837	834	831	828	826	823	821	818	815	812	810	807	804	802	799	797		
690	761	857	855	852	849	846	843	840	837	835	832	829	827	824	821	818	815	813	810	808	805	803		
695	767	863	861	858	855	853	850	847	844	841	839	836	833	830	827	824	821	818	816	813	811	809		
700	773	870	867	864	862	859	856	853	850	847	844	842	839	836	833	830	827	825	822	819	816	814		
705	779	876	874	871	868	865	862	859	856	853	850	847	845	842	839	836	834	831	828	825	823	820		
710	785	882	880	877	874	871	868	865	862	859	856	853	851	848	845	842	840	837	834	831	828	826		
715	792	888	886	883	880	877	874	871	868	865	862	859	857	854	851	848	846	843	840	837	834	832		
720	798	895	893	890	887	884	882	880	877	874	871	868	865	862	859	857	854	851	848	845	843	840		
725	804	901	899	896	893	890	888	885	883	880	877	874	871	868	865	862	859	857	854	851	848	846		
730	810	907	904	901	898	895	892	890	887	884	881	878	875	872	869	866	863	860	857	854	852	849		
735	817	913	910	907	904	901	898	895	892	890	887	884	881	878	875	872	869	866	863	860	857	855		
740	823	920	917	914	911	907	904	901	898	895	892	890	887	884	881	878	875	872	869	866	863	861		
745	829	926	923	920	917	914	911	907	904	901	898	895	892	890	887	884	881	878	875	872	869	867		
750	835	932	929	926	923	920	917	914	911	907	904	901	898	895	892	890	887	884	881	878	875	873		
755	841	938	935	932	929	926	923	920	917	914	911	907	904	901	898	895	892	890	887	884	882	880		
760	848	945	941	938	935	932	929	926	923	920	917	914	911	907	904	901	898	895	892	890	887	885		
765	854	951	947	944	941	938	935	932	929	926	923	920	917	914	911	907	904	901	898	895	893	891		
770	860	957	954	950	947	944	941	938	935	932	929	926	923	920	917	914	911	907	904	901	899	897		
775	867	963	959	956	953	950	947	944	941	938	935	932	929	926	923	920	917	914	911	908	906	904		
780	873	969	966	963	960	957	954	951	948	945	942	939	936	933	930	927	924	921	918	915	913	911		

Calculated by E. H. Clarke

(e) *The Caloric Value of Oxygen.* (4.825 calories per liter of oxygen absorbed.) This value varies slightly according to the proportion of fats and carbohydrates oxidized by the subject. With trained subjects, and from relatively prolonged or repeated periods of observations, the caloric value of oxygen is accurately deducted from the Respiratory Quotient (Vol. CO_2 eliminated) \div (Vol. O_2 consumed). (Carpenter', p. 104, Table 13.) But during short periods of observations the volume of CO_2 eliminated fluctuates much more readily than the consumption of oxygen and, particularly with untrained subjects, Respiratory Quotients obtained even by the most refined technic, are of doubtful accuracy. It is, indeed, quite evident from a survey of the results secured with the kind of subjects met with in clinical work, that, in general, greater reliance can be placed on the average calculated caloric value of oxygen (which is 4.825, assuming .82 as the Average Respiratory Quotient) than on a determined value based on quotients obtained in short periods of observations.

(f) Factors for correcting to 0°C . and 760 mm. pressure: calculations made at the "Average Temperature" and "Barometric Pressure." (Carpenter's Tables, pp. 87-102, Table 10.) This table does not give barometric pressures below 741 mm., consequently a condensed table covering pressures from 600 mm. and above was prepared for this paper (See Table 1).

(g) *Normal Standards:* (Aub and Du Bois). For men and women, ages 14 to 80, in calories

per square meter of body surface per hour. (Carpenter', p. 122, Table 28. See p. 13 for description and use.)

(h) *Normal Standards:* (Harris-Benedict'). For men and women, ages 21 to 70, in calories per 24 hours predicted from body-weight, age and height. (Carpenter', pp. 110-121. Tables 24, 25 for men, and 26, 27 for women. See pp. 12, 13 for description and use.)

(i) *Normal Standards:* (Carpenter', pp. 108-109. See also pp. 11, 12 for description and use.) Table 19 (Benedict and Talbot), for new-born infants. Table 20 (Benedict and Talbot), for boys and girls. Table 21 (Benedict and Hendry), for girls from 12 to 17 years of age, for whom this table should be used in preference to Table 20.¹⁹

(j) *Basal Metabolic Rate:* Expressed in per cent. above or below the Normal Standard. Considering 0 as the Normal Average Rate, the normal range has generally been placed between -10% and +10%.

Sample Determination of the Basal Metabolic Rate, based on the following Kymograph Tracing (Fig. 3) of the movements of the spirometer bell, and on the data recorded in this particular case.

CASE. Mr. E. H. C. Age 38. Height, 176 cm. Net weight, 84.0 kgs. (a) Body surface, 2.0 sq. m.; Bar. pressure, 745 mm. (f) Factor for T. and P., .901. (h) Normal average, 39.5. (e) Cal. value O_2 , 4.825 per liter. (b) Ave. Temp., 24°C . (c) Temp. Iner., 0. Time, 6 min. (d) Rise O_2 line in 6 min., 94 mm. (j)

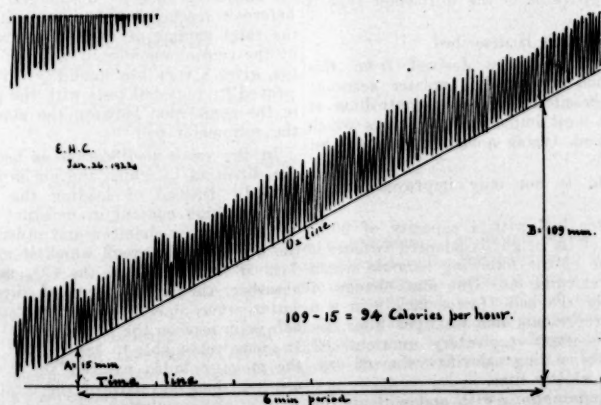


FIG. 3.—Sample "Graphic" illustrating method of measuring the fall of the spirometer bell from a selected six-minute section of a kymographic tracing of the movements of the bell taken during a respiration test.

Basal metabolic rate +7% (See below). (d) Rise O_2 line in 6 min. = 94 mm. (See graphic above). Spirometer bell factor, 20.73. (The lettering refers to the corresponding explanatory paragraphs above enumerated.

Calculations: 94 mm. rise of the O_2 line in 6 min. (See graphic), representing 94 calories per hour (d), the calculations are reduced to the following simple steps:

1. Correct for temperature and pressure (f)
 $94 \times .901 = 84.69$ Cal. per hour.
2. Divide by body surface in sq. m. (a)
 $84.69 \div 2 = 42.3$ Cal. per sq. m. per hour.
3. Estimate per cent. increase (or decrease) from the predicted normal average 39.5 (h): 42.3 is 7% above 39.5; in other words, the basal metabolic rate in this case is +7 (j).

Sample Determination of the Basal Metabolic Rate of the case above given, but calculated from the Spirometer Readings taken at the beginning and at the end of a period directly from the mm. scale of the apparatus.

Assuming that a 10 min., 18 sec. (10.3 min.) period, with a spirometer difference of 161.5 mm., was recorded, the calculations in this case would merely require to first convert the 161.5 mm. in 10.3 min. to the equivalent in 6 min.: (161.5 mm. in 10.3 min. = 94 mm. in 6 min.) after which proceed as above given ($94 \times .901 \div 2 = 42.3$ Cal. per sq. m. per hour) which is a metabolic rate of +7.

SUMMARY.

The adaptation of the kymograph for the determination of the metabolic rate by means of respiration apparatus of the spirometer type is urged.*

A complete outfit is described.

The advantages to be derived from this graphic method are chiefly: greater accuracy through the possibility of better controlling or verifying the most important conditions which must be insured during a test in both subject and apparatus.

The technic is not only improved but is simpler.

A spirometer bell with a capacity of 20.73 c.c. per mm. of its height is adopted because it allows the use of the following formula which shortens the calculations: One mm. change of the position of the bell (factor 20.73) in a 6 min. period represents one Cal. per hour, assuming the average respiratory quotient .82 with the corresponding calorific value of oxygen of 4.825 Cal. per liter.

Sample determinations with and without the kymograph are given.

*Confirmatory evidence is about to be published from the Nutrition Laboratory, Boston, Mass., by Dr. F. G. Benedict, who, I learn, has conducted an independent research along similar lines.

REFERENCES.

- *Benedict, F. G.: *Deutsches Archiv f. Klinische Medizin*, Vol. 107, 1912, p. 175. See also Benedict, F. G.: *Jour. A.M.A.*, Vol. 77, No. 4, p. 248, July 23, 1921.
- *Edsall, David L.: *Clinical Study of Respiration*. *Bos. Med. AND SURG. JOUR.*, Vol. 167, No. 19, pp. 639-651, November 7, 1912.
- *The "Porter" Kymograph, Medium Spring. Made by the Harvard Apparatus Co., Back Bay F. O., Boston, Mass.
- *Recently a cone-shaped metal pen point was tried with satisfactory results. It is made by the Republic Flow Meters Co., Diversey Parkway, Chicago, Ill., and is designated as Type I.T.L. A special ink must be used, and is obtainable in red or green. The same firm just announces a "New Style V-Shape Pen," which will not readily clog.
- *The suggestions given above are intended for operators who may wish to adopt this kymographic method. Mr. Warren E. Collins, 684 Huntington Ave., Boston, Mass., will give assistance in securing any of the parts needed.
- *Benedict, Jour. A.M.A., Vol. 77, No. 4, p. 248, July 23, 1921.
- *Carpenter, Thorne M.: *Tables, Factors, and Formulas for computing Respiratory Exchange and Biological Transformations of Energy*. Publication 303, Carnegie Institution, Washington, D. C., 1921.
- *Benedict, F. G.: *BOSTON MED. AND SURG. JOUR.*, Vol. 178, No. 30, p. 675, May 16, 1918.
- *Benedict, Emmes, Roth, and Smith: *Average Respiratory Quotient for 88 Men and 66 Women*. *Jour. Biol. Chem.*, 1914, 18, p. 139.
- *Benedict and Hendry: *BOSTON MED. AND SURG. JOUR.*, Vol. 184, Nos. 9-13, March 2, 10, 17, 24, 31, 1921.

PAPER IV.

MOISTURE-ABSORBING EFFICIENCY OF CARBON DIOXIDE ABSORBENTS.

In the valve type of apparatus air passes through the entire circuit at a much slower rate than with the assistance of the impeller, and, with the valves installed as here recommended, the direction of the air current is opposite to that obtained with the impeller.

In his "Notes on the Use of the Portable Respiration Apparatus," Benedict makes the following statement: "Although the large amount of moisture expired from the lungs of the subject is directly discharged into the bell before it reaches any form of water-absorbent, the total volume of expired air, when diluted by the continuous supply of air in the apparatus, gives a very low humidity. This has been proved by repeated tests with the psychrometer in the connection between the mouthpiece and the spirometer bell."

In the valve modification as here suggested, the direction in which the air is driven is reversed. Instead of leading the expired air with its high content in moisture and CO_2 to the spirometer chamber and other portions of the apparatus, through which it must pass before it finally reaches the CO_2 and moisture-absorber, the air is conveyed directly to the latter, where it is freed from moisture and CO_2 before it reaches the other part of the circuit. It seems reasonable to expect that in confining the moisture-laden expired air to parts which are less than one-sixth of the total circuit, the bulk of the circulating air could be maintained at a relatively high degree of dryness in spite of the decreased rate of ventilation. Therefore it might be assumed that, as with the impeller, no correction for moisture is neces-

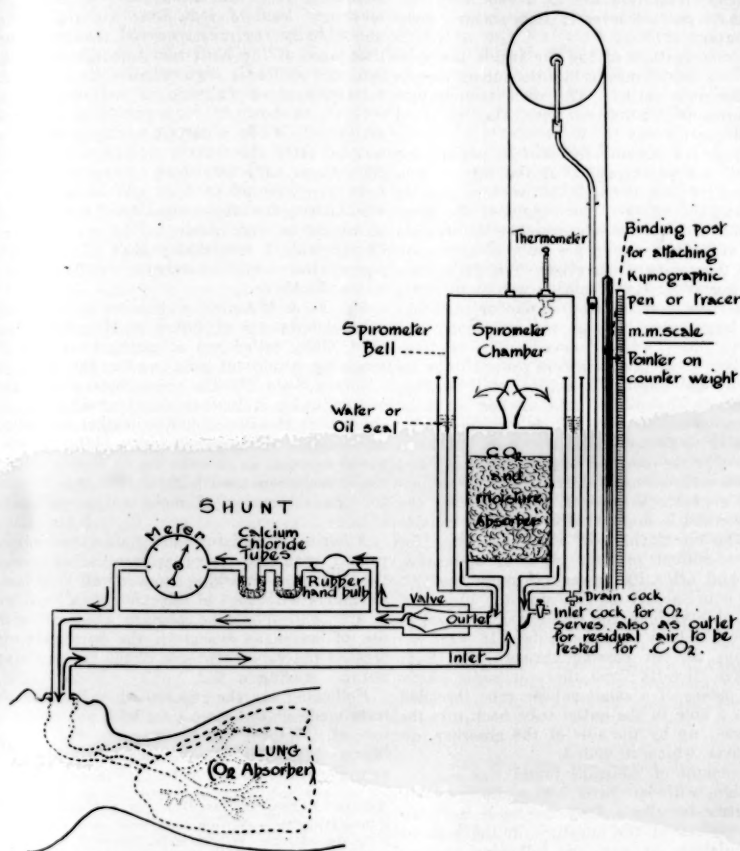


FIG. 1.—Diagram of the Benedict type of Respiration Apparatus (Roth "Valve" Modification), showing the entire so-called "closed" air-circuit. In addition, the diagram shows the rubber hand bulb, calcium chloride tubes, and air meter placed, as a by-pass, in the circuit for the determination of the moisture content of the circulating air during a test.

sary in the calculations. There was, however, a probability of error which, though relatively small, cannot be ignored, and investigation was deemed advisable.

Figure 1 shows diagrammatically how the apparatus was fitted up for the purpose of determining the amount of moisture present during the test, more especially in the bulk of the circulating air of both types of apparatus.

A shunt or by-pass was placed in parallel circuit with one or the other of the rubber tubings between the spirometer chamber and

the mouthpiece. The shunt, which included a rubber hand bulb, two calcium chloride tubes and a delicate gas meter, served to direct, during a test period, as much of the air to be tested as desired through the weighed calcium chloride tubes. After passing through the meter, the air was returned to the apparatus.

The technic which was uniformly carried out was as follows: "The apparatus was made ready as for the routine test; the subject breathed in it for a total period of ten minutes; the first five minutes were allowed to

bring the circulating air to a relatively uniform and constant level of temperature, moisture content, etc.*

The temperature of the air inside the spirometer was noted once a minute during the entire 10-minute period. The room temperature and barometric pressure were also recorded once for each test.

During the second five-minute period, ten litres of air was directed, at the rate of two litres per minute, through the calcium chloride tubes and the meter. The weight of the moisture collected by the calcium chloride was obtained and calculated in per cent. of saturation at the temperature observed. Simultaneously with this gravimetric estimation, a dry and a wet bulb thermometer, inserted in one or the other of the large tubes between the spirometer and the mouthpiece, were observed. The readings taken from these thermometers proved to be inconsistent and unreliable, due to conditions unfavorable to the use of this method of moisture determination with the valve type of apparatus or to faulty technic, or both. After a number of trials, their use was discontinued, and the observations based entirely on the estimation of moisture by weight. At any rate, the latter method is undoubtedly the more reliable one. The circulating air was thus tested for moisture content in both types of apparatus, before and after its passage through the CO₂ and moisture-absorber. To suit the object of certain observations, the shunt was reversed at times or fitted on the other tube. In some observations the air passing through the shunt was taken directly from the spirometer chamber by means of a small rubber tube threaded through a hole in the outlet tube back into the spirometer, up by the side of the absorber, directly over which it ended.

The amount of moisture found was surprisingly high, with but little better showing with the electric impeller. Several closely agreeing determinations of the moisture in the bulk of the circulating air gave the following average results:

With valves, 57 per cent. saturation.

With impeller, 61 per cent. saturation.

Determinations were also made with the valves so installed as to reverse their action and to circulate the air in the same direction as that obtained with the impeller, with a resulting average of 79 per cent. saturation. Little thought had been given, up to this time, to the possibility that the discrepancy between these results and those reported by Benedict might be due to the kind of soda lime used. In fact, the impression was, as expressed by Dr.

Benedict, that, "In this type of apparatus, almost any kind of soda lime will do." This undoubtedly was quite true with the type of soda lime used at the Nutrition Laboratory in Boston, and which is high alkali soda lime and a relatively good moisture as well as CO₂ absorbent, as shown by its readiness to deliquesce and clog. When a certain grade of soda lime secured from the market proved to be very inefficient in CO₂ absorbing power, "Wilson" soda lime was adopted in our work and was used when the above-mentioned moisture determinations were made. This grade has unquestionably a remarkably high CO₂ absorbing power, but unfortunately is inefficient as a water-absorbent.

Mr. E. J. Warnick, technician in the metabolism laboratory of Lakeside Hospital, Cleveland, Ohio, called my attention to a very interesting absorbent sold under the name of "Natron Soda." He claims most satisfactory results using it in combination with calcium chloride in the Benedict Respiration Apparatus. Although it deliquesces very rapidly when exposed to moist air, I have found it very adaptable, even when used without calcium chloride, for the absorption of moisture as well as of CO₂.

A series of moisture determinations was repeated with the valve apparatus, comparing the moisture-absorbing power of "Wilson" soda lime with that of "Natron soda." It was desirable to determine, also, to what extent the use of water as a seal in the spirometer increased the vapor contents of the air in the apparatus during a test.

Following are the results, which include also tests made at the same time with the combined use of "Wilson" soda lime covered with a layer, only one inch in thickness, of coarsely granular calcium chloride.

AVERAGE SATURATION IN BULK OF CIRCULATING AIR.

6 determinations—Wilson soda lime—water seal	73%
2 determinations—Wilson soda lime—oil seal	63%
Per cent. of moisture due to water seal	10%
4 determinations—Natron soda—water seal	11%
4 determinations—Natron soda—oil seal	0%
Per cent. of moisture due to water seal	11%
3 determinations—Wilson soda lime—one inch layer calcium chloride—water seal	39%

These results clearly show that even with a water seal a sufficient degree of dryness of the air in the valve apparatus can easily be obtained, making it unnecessary to make a correction for moisture in the calculation if the air is maintained below 20 or 25 per cent. saturation.

Oil as a seal is somewhat objectionable, as it prevents easy access to the absorber inside the spirometer chamber, merely on account of the

*Under ordinary conditions not less than 2 or 3 minutes are required to establish this "level," but may not always suffice to also bring the subject back to the "basal conditions" which the usual half-hour rest before a test is intended to insure, but which are more or less disturbed in the process of "connecting" and setting the apparatus in operation.

*Sold by the Uehling Instrument Co., 71 Broadway, New York City.

†In routine determinations a larger amount (about 3-inch layer) of coarsely granular anhydrous calcium chloride is advisable.

oil dripping from the bell when it is removed.

The reader will very much appreciate the following communication received from Professor Robert E. Wilson, Director of the Research Laboratory of Applied Chemistry, Massachusetts Institute of Technology, Cambridge, Mass.

"Replying to your letter of October 18, with regard to the use of our soda lime for Benedict's apparatus, would say that you are quite correct in stating that we do not claim for the soda lime any appreciable water-absorbing power. As pointed out in my article on 'Soda Lime as an Absorbent for Industrial Purposes,'¹ high efficiency for CO₂ can only be obtained by having a low alkali content and a high water content, which of necessity gives a high vapor pressure to the air. By increasing the alkali content to 6 per cent., and reducing the water content to 14 per cent., thereby sacrificing distinctly in efficiency of CO₂ absorption, it is possible to make a soda lime which will maintain a somewhat lower vapor pressure, but even this soda lime cannot be considered in any sense as an efficient drying agent. The use of still higher alkali contents inevitably results in caking, channeling, overheating, low efficiency for CO₂, and the other evils attendant upon using high alkali soda lime, such as is now on the market.

"It is our conviction that if it is desired to absorb both CO₂ and moisture, the most efficient method, from a standpoint of both cost and bulk of absorbent required for a given amount of absorption, is to use our regular soda lime for CO₂ and anhydrous calcium chloride for absorbing moisture, since the latter is very efficient in this respect and forms solid hydrates rather than the deliquescent mass produced when the water is absorbed by caustic soda."

Based on observations made for over a year, I find that caustic soda, especially in the form of Natron soda, has, weight for weight, more CO₂ absorbing capacity than any grade of soda lime which I have ever tried. Besides, I have found it to still absorb moisture efficiently after it has become unfit for complete CO₂ absorption. On the other hand, the absorbing power of soda lime for moisture is lost long before it becomes unfit for CO₂ absorption.

I have used, with splendid success, soda lime mixed with caustic soda or "Natron Soda," and likewise Wilson soda lime combined with calcium chloride. The tendency to cake and clog is less marked with the latter combination than when Natron soda or caustic soda is used alone or in combination with soda lime. I have not tried the combination of Natron soda with calcium chloride.

Whatever the material used, it should in any case be examined frequently enough to prevent clogging. It is no trouble at all to occa-

sionally (once or twice a week, or oftener if necessary) empty the contents of the container, remove only the caked portions and return the rest to the can with the addition of some fresh material. In this way the efficiency of the contents of the absorber can be much prolonged.

When as much moisture as 80 per cent. saturation is present in the bulk of the circulating air, the error involved amounts to 1.5 to 3 per cent., according to the temperature during a test. Consequently, the use of a good absorbent for moisture very easily brings the error within negligible limits. On the other hand, if an efficient moisture absorbent is used, whether it be with the impeller or with the valves, an empirical average correction of minus 2 per cent. should be made.

CONCLUSIONS.

In the determination of the metabolic rate by means of the Respiration Apparatus (spirometer type), the absorption of moisture from the circulating air must be insured.

A good absorbent for carbon dioxide may have a low moisture-absorbing power.

A good CO₂ absorbent used with an efficient moisture-absorbent makes an ideal combination.

An average correction of 2 per cent. should be made if the circulating air is maintained at a high degree of moisture content.

This series of papers would not be complete without a free, though brief acknowledgment of my great indebtedness to Dr. Thorne M. Carpenter of the Nutrition Laboratory, Boston, Mass., for his contribution of valuable time in going over this series of papers, and for the helpful criticism which he has very freely offered.

REFERENCES.

- ¹ Benedict, F. G.: *BOST. MED. AND SURG. JOUR.*, Vol. 185, No. 10, pp. 242-245, March 4, 1920.
- ² Benedict, F. G.: *BOST. MED. AND SURG. JOUR.*, Vol. 185, No. 16, pp. 449-452, October 14, 1920.
- ³ Wilson, Robert E.: *Soda Lime as an Absorbent for Industrial Purposes. Jour. of Indust. and Engineering Chem.*, Vol. 12, No. 10, p. 1060, October, 1920.

VAGINAL CESAREAN SECTION, WITH A REPORT OF TWELVE CASES.

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In order that the deep, irregular cervical tears which are apt to follow a rapid delivery through a rigid, undilated cervix might be avoided, Dührssen, in 1890, recommended that deep incisions be made in the vaginal portion of the cervix. These incisions were made in either the anterior or the posterior halves of the cervix, or both, but the lateral portions

were avoided. It was soon found, however, that the incisions did not reach high enough to overcome the resistance of the internal os, that extensive lacerations which were difficult to suture were apt to follow, and that hemorrhages which were difficult to control sometimes occurred.

Realizing that his incisions in the cervix did not enlarge the canal sufficiently for immediate delivery, Dührssen devised the operation which, in 1895, he described under the name of "anterior vaginal hysterotomy," and in 1896 called vaginal cesarean section. The original operation only called for the anterior incision; later, he modified the technic by adding the posterior incision. The result of this was that it enabled him to make a shorter anterior incision, thereby lessening the danger of injury to the bladder during the delivery.

TECHNIC OF OPERATION.

A weighted speculum is introduced in the vagina to expose the cervix, which is brought down by means of double hooks placed on the anterior lip, one on either side of the cervical canal. If the cervix is not readily brought down by this method, as after an amputation, a No. 4 Voorhees bag is introduced in the uterus; it is filled with one per cent. lysol solution, and used as a tractor.

The lower limit of the bladder is found by introducing a male sound in the organ, the concavity of the sound pointing towards the operator; a transverse incision is made in the vagina just below the point of the sound, this incision is carried through the mucosa and fascia of the anterior vaginal wall. Sharp, pointed scissors are introduced under the vaginal wall and separate it from the bladder to within an inch of the urethra. The vaginal wall is then incised to the upper limit of the dissection, the bladder is separated from the vagina, and after cutting the uterovesical ligament from the uterus.

The bladder is now held out of the way by means of a retractor, and the anterior lip of the cervix is incised beyond the internal os. The posterior lip of the cervix is pulled upwards, towards the symphysis, with double hooks or the bag, as the case may be, and a transverse incision is made at the junction of the vagina and the cervix. The cul-de-sac and the rectum are reflected downwards, and the posterior lip is incised as far up as possible, care being taken not to enter the peritoneal cavity.

The instruments are now removed and the hand is introduced in the uterus, an internal podalic version is performed in the usual way, and the placenta is extracted manually. By injecting pituitary extract or ergot, the bleeding is usually controlled so that packing is rarely necessary.

The cervical incisions are closed with No. 2 chromic catgut, interrupted; the vaginal incisions are sutured in the same manner with the same material.

When the fetus is small it is not necessary to incise the cervix posteriorly, as the anterior incision usually gives enough room for its extraction.

CASE 1. Mrs. R. M. Age 27. Para 1. Indication—Rigid cervix at term. Confinement expected March 15, 1916. Operation March 29, 1916. Pelvic measurements normal.

On March 27, 1916, the patient was sent to St. Margaret's Hospital. She was having slight uterine contractions, but making no progress in dilatation; the cervix was very rigid.

Ether was administered and a No. 2 Voorhees bag introduced in the cervix at 6 P.M. At 8 P.M., the patient was having contractions, which lasted 30 to 45 seconds, every two minutes. At 8 A.M. the next morning (March 28, 1916), 14 hours after the introduction of the bag, the patient was still having contractions, but the cervix had not dilated and the bag was still in place; it was removed by letting out the fluid. The parturient was given, at this time, morphine sulphate gr. 1/6, and scopolamine hydrobromide gr. 1/200, s.c. At 3 P.M., the contractions had stopped, the temperature was 98.6, the fetal heart 140 and of good quality; at 8 P.M., the contractions were strong and regular; while at 10.30 P.M., despite the regular contractions, there was no progress noted; the fetal heart was still 140.

March 29, 1916, 2 A.M. Examination. The cervix admitted two fingers, but was not taken up and had not thinned out; manual dilatation was attempted but given up as the rigidity could not be overcome. The fetal heart had gone up to 160, and the mother's pulse to 120. After consultation, it was decided to deliver the parturient because of the rise of maternal and fetal pulse rates. The vaginal cesarean section was decided upon because of the roomy pelvis, and also because of the danger of infection due to the long labor with a bag, if the abdominal route were chosen.

March 29, 1916. Vaginal cesarean section. Anterior and posterior incisions. Left episiotomy. Delivery of a male child with forceps. Manual extraction of the placenta. Puerperium. The baby, which was etherized, was readily resuscitated by tubbing. The mother's pulse was weak and 160 at the end of operation. She was given salt solution by hypodermoclysis.

March 30, 1916. The mother is nursing her baby. Her temperature is normal, and her pulse is 108.

April 1, 1916. The baby died. Cause of death, intracranial hemorrhage, from long labor and forceps.

April 3, 1916. The episiotomy stitches were removed. The patient continues to improve.

April 11, 1916. An infection was noted in the episiotomy wound. The lower end of the incision was opened and drainage was established.

April 18, 1916. Daily dressings to the incision, which is healing fast.

April 29, 1916. The episiotomy wound was cleanly healed and the patient was discharged from the hospital.

April 29, 1916. Discharge Examination: The episiotomy wound is healed, as well as the cervical and vaginal incisions; the uterus, which is in first degree retroversion, has well involuted. There are no masses or areas of tenderness in the pelvis.

CASE 2. Mrs. E. M. Age 28. Para III. Indication—Toxemia of pregnancy, convulsive type. Seventh month of pregnancy. On January 23, 1918, the patient was admitted to St. Elizabeth's Hospital, after having had two convulsions. She was markedly toxic and irrational. The urine showed a large amount of albumin, while in the sediment a large number of casts were seen, the systolic blood-pressure was 170, and the edema was marked. The fetal heart, which was 140 in rate, was heard in the right lower quadrant. The cervix was long and rigid and the patient had had no labor. The family and past histories were irrelevant, while the previous obstetrical history revealed the fact that she had miscarried twice, in the third month of pregnancy.

January 23, 1918. *Vaginal cesarean section. Anterior and posterior incisions. Internal podalic version and breech extraction of a seven-months female child. Manual extraction of the placenta. Puerperium.*

January 24, 1918. The patient made a good ether recovery; she has had no further convulsions, her systolic blood-pressure is 140, and her edema is rapidly decreasing. The baby is doing well.

January 25, 1918. The patient is voiding normally and her blood-pressure is 134. The baby is being fed with a dropper.

January 28, 1918. Both mother and baby continue to improve.

February 2, 1918. The puerperium has been afebrile, the edema has disappeared, and there are no bladder symptoms. The baby is doing well.

February 4, 1918. Discharge Note: The vaginal incisions and the cervix are well healed, the uterus has involuted in good position. There are no masses or areas of tenderness in the pelvis.

This patient was readmitted to St. Elizabeth's Hospital on May 8, 1920. The examination showed a pregnancy at term, with a vertex presenting in L. O. A. At the onset of labor, the cervix was soft, and the scars in the

anterior and posterior lips could not be felt. It was decided to give the patient the test of labor. She dilated readily and without the least difficulty, and was delivered normally of a male child. There was a slight second degree laceration of the perineum, which was repaired at the end of the third stage.

Examination at the time of discharge revealed a small laceration of the cervix antero-posteriorly. The uterus was well involuted and in good position, and the adnexa were normal. The perineum was healed and gave good support.

CASE 3. Mrs. C. O. Age 24. Para I. Indications—Rigid cervix. Attempted delivery through an undilated cervix. Prematurity, six months. Dead fetus.

May 17, 1918. The patient, who was six months pregnant, had been in labor twenty-four hours when admitted to St. Elizabeth's Hospital. She had been etherized twice and attempts at delivery had been made outside. On admission, one leg was protruding through the vulva. Her family physician stated he had attempted to deliver her because of uterine bleeding.

The parturient was prepared for a vaginal delivery and etherized for the third time. The protruding leg showed dislocation of the knees and ankle joints, the cervix had contracted on the leg, and the uterus was tonic; it was impossible to introduce a finger in the cervix since it had so firmly shut down on the leg. No sign of bleeding was noticed.

March 17, 1918. *Vaginal cesarean section. Anterior incision. Breech extraction of a still-born male fetus. Manual extraction of the placenta, which was not detached nor implanted in the lower uterine segment. Puerperium.*

May 20, 1918. The highest temperature has been 100 and the highest pulse 120; the temperature is now normal and the pulse 80. The patient has voided normally since the operation and the bowels have functioned normally. The convalescence has been satisfactory.

May 24, 1918. The temperature and pulse are normal. The patient has no discomforts.

May 30, 1918. Discharge Note: The cervix and anterior vaginal wall are well healed, the uterus has involuted in good position; the adnexa are normal, and there is no pelvic tenderness.

CASE 4. Mrs. D. O. Age 18. Para II. Indications—Pyelitis. Kinked right ureter. Seventh month of pregnancy.

The patient was admitted to St. Elizabeth's Hospital on June 7, 1918. She had had a normal delivery at term nineteen months previously. She was pregnant for the second time at the middle of the seventh month. For a week she had been confined to bed with excruciating pain over her right kidney. On ad-

mission to the hospital, her temperature was 104, pulse 140, and respirations 20.

The examination made at 4 P.M. showed the right kidney to be exquisitely tender, and the catheterized specimen of urine showed a large amount of pus and an occasional red blood corpuscle. At midnight, eight hours later, the patient's condition was worse and after consultation, it was decided to induce labor to relieve the pressure on the right ureter. With this end in view, the patient was etherized and a No. 4 Voorhees bag introduced in the cervix.

June 8, 1918. The bag had been in the cervix eight hours, the patient had had strong labor, but this had had no effect as far as dilatation was concerned.

June 8, 1918. *Vaginal cesarean section. Anterior and posterior incisions over Voorhees bag. Internal podalic version and breech extraction of a male child, which lived twenty-four hours. Manual extraction of the placenta. Puerperium.*

June 9, 1918. The patient is markedly irrational. She has made a good ether recovery.

June 10, 1918. The mental condition has improved. The urine shows a large amount of pus. Hexamethylenamine and acid sodium phosphate aa Gr. x, were prescribed.

June 13, 1918. The urine is still filled with pus, the pain over the right kidney has disappeared, the temperature and pulse are normal and the patient is rational.

June 16, 1918. The patient is allowed out of bed.

June 17, 1918. The improvement is continuous. There is no rise of temperature or pulse, and the urine is clearing up.

June 22, 1918. Discharge Note: The incisions in the vagina, as well as in the cervix, are well healed. The uterus is involuted in good position. There are no masses or areas of tenderness in the pelvis. The urine is clear and there is no tenderness in the region of the right kidney.

(March, 1920. The patient was delivered at term, in her home, by her family physician. The delivery was normal and there were no complications.)

CASE 5. Mrs. A. McK. Age 31. Para I. Indications—Macerated fetus at four months. Previous nephrectomy. Last catamenia, December 17, 1917. Confinement expected September 23, 1918. Past History—Twelve years previously, dilatation and curettage for dysmenorrhea at the New England Hospital for Women. Twelve years previously, appendectomy at the Homeopathic Hospital. Ten years previously, laparotomy for the removal of a left ovarian cyst at the Boston City Hospital. Five years previously, nephrectomy (right kidney) for pyonephrosis, at Albany, N. Y.

April 11, 1918. Examination showed the uterus to be the size of a four-months pregnancy. There was no fetal heart heard.

July 18, 1918. Amenorrhea still exists. There is no change in the size of the uterus, and no fetal heart sounds are heard. The patient is to report in a month.

August 13, 1918. The uterus has not changed in size. There has been no change in mensuration since April.

The patient was admitted to St. Elizabeth's Hospital. On August 22, 1918, she was etherized; the cervix was dilated so that it admitted one finger; the organ was very rigid and could not be dilated any further. The finger was introduced in the uterus and a soft, macerated fetus was felt. Since the patient had but one kidney, and in order to save her from a second etherization, it was decided to deliver her by vaginal cesarean section.

August 22, 1918. *Vaginal cesarean section. Anterior and posterior incisions. Internal podalic version and breech extraction of a four-months macerated fetus. Manual extraction of the placenta. Puerperium.*

August 23, 1918. The patient made a good ether recovery.

August 26, 1918. The patient is doing well. She is having house diet; she is voiding normally, and her bowels have resumed their normal function. The temperature is 99 and the pulse 100.

September 2, 1918. The temperature and pulse are normal and the patient makes no complaint.

September 7, 1918. The patient is discharged from the hospital.

October 9, 1918. Examination, at the office, showed the following results. The cervix is healed and there are no raw areas. The anterior and posterior incisions are healed, the uterus is in good position and movable. There are no masses or areas of tenderness in the pelvis.

On December 8, 1920, the patient had urinary suppression from a kink in her left and only ureter. The kidney was suspended and she has been free from symptoms since.

CASE 6. Mrs. E. S. Age 35. Para I. Indication—Toxemia of pregnancy, convulsive type. Seven and a half months of pregnancy.

The patient was seen at St. Elizabeth's Hospital on July 8, 1919. She had severe headaches, marked edema of the face and extremities, and a high blood-pressure. The urine showed a large trace of albumin and casts of all varieties. The vertex was presenting in R. O. P., the fetal heart sounds were heard in the right lower quadrant, and the pelvis was roomy.

The patient was treated expectantly by being kept in bed and on a strict milk diet. On August 2, 1919, at 3.30 P.M., the systolic blood-

pressure was 250; there was marked twitching of the muscles and an increase in the amount of albumin and renal elements. After consultation, it was decided to induce labor. At 4 P. M., the same day, the patient was given ether, and a No. 4 Voorhees bag was introduced in the cervix. At midnight, eight hours later, the bag had had no effect in starting labor. The parturient was again taken to the operating room and etherized.

August 3, 1919. *Vaginal cesarean section. Anterior and posterior incisions over Voorhees bag. Internal podalic version and breech extraction of a seven and a half months stillborn female fetus. Manual extraction of the placenta. Puerperium.*

August 3, 1919. The parturient had a convulsion at 6 A.M., and no other. Her pulse was 108 to 110, her temperature was normal, and there was still considerable edema of her extremities. She voided eighteen ounces of smoky urine, and catheterization was not necessary during any part of her convalescence. Magnesium sulphate, morphia, and heaters were prescribed.

August 14, 1919. The convalescence has been satisfactory. There has been no undue elevation of pulse or temperature. The patient has been allowed out of bed.

August 17, 1919. The urine still shows albumin and casts, although the blood-pressure is gradually coming down. The patient is advised to report to her family physician for further treatment.

January 23, 1920. Examination at the office shows the cervical and vaginal incisions well healed, the uterus normal in size and position, freely movable, and the adnexa normal. There are no masses or areas of tenderness in the pelvis. The blood-pressure is 160/100, and the patient is still on a non-protein diet.

CASE 7. Mrs. B. E. M. Age 30. Para I. Indications—Advanced pulmonary tuberculosis. Macerated fetus six and a half months.

The patient had been treated by her family physician, who had had several consultations. A diagnosis of advanced pulmonary tuberculosis had been made. She was seen at the Charlesgate Hospital, where she had been admitted on February 23, 1920.

The examination showed a six and a half months pregnancy and a long, rigid cervix. The fetal heart tones were not heard, and the patient had not felt life for some days. The consultants felt that because of her pulmonary condition she should be delivered at once. She was in a very poor physical condition. Her temperature was 102, and her pulse 140.

February 23, 1920. *Vaginal cesarean section. Anterior and posterior incisions. Internal podalic version and breech extraction of a male, macerated fetus. Manual extraction of the placenta. Puerperium.*

The patient had left the table with a pulse of 150. Surgically, the convalescence was uneventful. She ran an evening temperature, ranging from 101 to 100; the pulse gradually came down to 120, then to 100. The parturient voided normally throughout the puerperium, and the bowels were taken care of with enemata.

March 6, 1920. Discharge Note: The cervical and vaginal incisions are well healed, the uterus is involuted in good position, the adnexa are normal. There are no masses or areas of tenderness in the pelvis.

March 7, 1920. The patient was discharged to her family physician for further treatment of her pulmonary condition.

CASE 8. Mrs. A. C. Age 23. Para I. Indication—Toxemia of pregnancy, convulsive type. Seventh month of pregnancy.

The patient was admitted to St. Elizabeth's Hospital on June 7, 1920. She had then had seven convulsions. The examination revealed a seven-months pregnancy. The fetal heart was indistinct. There was marked edema of the face and extremities, and the systolic blood-pressure was 210. The urine, which was smoky, contained a very large trace of albumin, and the sediment showed fresh blood, as well as hyaline and granular casts. The patient was delivered at once because of the severe toxemia and the frequency of the convulsions.

June 7, 1920. *Vaginal cesarean section. Anterior and posterior incisions. Internal podalic version and breech extraction of a female child which lived six hours. Manual extraction of the placenta. Puerperium.*

June 8, 1920. The patient made a good ether recovery. She voided normally, and had a normal pulse and temperature.

June 10, 1920. The breasts are filling up. A tight breast binder and magnesium sulphate were ordered.

June 12, 1920. The convalescence has been satisfactory. There has been no elevation of pulse and temperature, and the systolic blood-pressure is 180.

June 19, 1920. The patient is doing well. She is allowed out of bed.

June 22, 1920. Discharge Note: The cervical and vaginal incisions are well healed. The uterus is involuted in good position. The adnexa are normal. There are no masses or areas of tenderness in the pelvis. The systolic blood-pressure is 120, and the urine contains a v.s.t. of albumin, but no casts are seen.

CASE 9. Mrs. E. B. Age 25. Para I. Indications—Toxemia of pregnancy, non-convulsive type. Abruptio placentae. Uterine hemorrhage. Seventh month of pregnancy.

On July 27, 1920, the patient, who was admitted to St. Elizabeth's Hospital, showed

marked edema of the face and extremities. There had been marked bleeding from the uterus for several hours. The pulse was 120, and the systolic blood-pressure 170. The urine showed a large trace of albumin, granular and hyaline casts, small round cells, and red blood corpuscles. The abdominal examination showed the uterus to be the size of a seven-months pregnancy, while the vaginal examination showed a long, primiparous cervix.

The patient was prepared for delivery at once, because of the premature separation of the placenta and the hemorrhage.

July 27, 1920. *Vaginal cesarean section. Anterior and posterior incisions. Internal podalic version and breech extraction of a seven-months male, macerated fetus. Manual extraction of the placenta. Puerperium.*

July 28, 1920. The patient made a good ether recovery and had a good night. She voided normally.

July 30, 1920. There is no bladder discomfort. The patient voids normally. The breasts are engorged; they are treated by the application of a tight binder and the administration of magnesium sulphate. The temperature and pulse are normal.

August 1, 1920. The improvement is gradual. There is no discomfort, except for the breasts, which are still moderately engorged.

August 8, 1920. The patient is allowed out of bed. She is very comfortable.

August 11, 1920. Discharge Note: The vaginal and cervical incisions are well healed. The uterus has involuted in good position. There are no masses or areas of tenderness in the pelvis.

CASE 10. Mrs. B. A. Age 37. Para I. Indication—Toxemia of pregnancy, non-convulsive type. Seventh month of pregnancy.

The patient was seen for her family physician at the office. She complained of headaches, swelling of her ankles and twitching of her muscles. The headaches had existed since the onset of pregnancy. At the time of consultation, her restlessness was marked.

The examination of the abdomen showed the uterus to be the size of a seven-months pregnancy. A vaginal examination was not made at this time. The blood-pressure was 230/150. The patient was sent from the office to the Carney Hospital, where she arrived at 6 P.M. August 16, 1920. She was put to bed, given hot packs, magnesium sulphate and morphine sulphate, to the physiological limit.

August 17, 1920. The patient had spent a poor night. She had slept but very little. Her blood-pressure was 250/160. The urine showed a large trace of albumin, hyaline and granular casts, and fresh blood. Because of the rise in blood-pressure, despite the fact that she was on active treatment, it was decided to deliver her immediately, and vaginal cesarean

section was elected as the operation of choice.

August 17, 1920. *Vaginal cesarean section. Anterior and posterior incisions. Internal podalic version and breech extraction of a female child, who never took the initial breath, although the heart was beating at birth. Manual extraction of the placenta. Puerperium.*

The patient made a good ether recovery. The blood-pressure remained high the first few days and then began to subside.

August 22, 1920. The patient has done well since operation. She has voided normally, and the bowels have functioned readily with the aid of magnesium sulphate. The urine shows less albumin and the renal elements are gradually disappearing from the sediment.

August 26, 1920. The patient has continued to improve. A head-rest was ordered.

August 28, 1920. The patient was ordered out of bed. Examination of the urine showed a rare hyaline cast; otherwise, it was negative.

September 1, 1920. Discharge Note: The cervical and vaginal incisions are well healed. The uterus has involuted in good position. There are no masses or areas of tenderness in the pelvis.

The patient was discharged to her family physician for further observation.

CASE 11. Mrs. M. M. Age 41. Para II. Indication—Toxemia of pregnancy, non-convulsive type. Seventh month of pregnancy. The past history was negative, except for the fact that the patient had had a miscarriage at three months, in 1919.

On January 31, 1921, the patient was seen at the office. She complained of severe headaches and swelling of her ankles. She was then seven months pregnant. Examination revealed marked edema of the hands and ankles, chemosis of the eyeball, and a blood-pressure of 190/100. She was sent to the Carney Hospital, where she was admitted in the late afternoon. At 11 o'clock the same evening, she was again seen. The blood-pressure was then 198/108, and the patient had become totally blind shortly after her admission to the hospital. Because of the severe toxemia and the long, rigid cervix, it was decided to deliver her by vaginal cesarean section.

February 1, 1921. *Vaginal cesarean section. Anterior and posterior incisions. Internal podalic version and breech extraction of a seven-months, stillborn, female child. Manual extraction of the placenta. Right episiotomy. Puerperium.*

February 2, 1921. The patient made a good ether recovery. She still complains of severe headaches, and is still blind.

February 4, 1921. The patient's convalescence is surgically satisfactory. The headaches are still troublesome, although the vision is improving. She is now able to discern large objects. The blood-pressure still remains high.

February 7, 1921. There is a marked general improvement. The headaches have disappeared and she has completely recovered from the blindness.

February 11, 1921. The patient feels well. She is sitting up in bed, enjoys a protein-free diet, and makes no complaints.

February 13, 1921. The patient is allowed to sit in a chair. She has apparently completely recovered.

February 17, 1921. Discharge Note: The episiotomy wound is healed. The cervical and vaginal incisions are healed. The uterus has involuted in good position. There are no masses or areas of tenderness in the pelvis. The urine still shows a trace of albumin, but no casts are found.

The urine examination was negative one month after her discharge from the hospital.

CASE 12. Mrs. Z. B. Age 42. Para IV. Indications—Previous amputation of the cervix. Toxemia of pregnancy, non-convulsive type. Inevitable miscarriage at 5½ months. Past History—The patient had had two previous operations, the first consisting of a dilatation and curettage, with an abdominal suspension, and the second, of an amputation of the cervix, an anterior colporrhaphy and a colpoperineorrhaphy. The previous obstetric history was irrelevant.

The patient was admitted, in labor, to the Carney Hospital on March 22, 1921. She was then 5½ months pregnant. She had been bleeding for 48 hours. The cervix was dilated to admit one finger. The membranes were ruptured, and the fetal heart sounds were not heard. The blood-pressure, on entrance, was 200/95, and the urine examination showed the following: sp.g. 1015, sugar absent, albumin s.p.t., sediment, considerable pus, few red blood corpuscles, a number of very granular renal cells, and a rare, fine granular cast.

The contractions persisted regularly, but because she made no progress with them, she was etherized, and a No. 4 Voorhees bag inserted. This was allowed to remain in position twelve hours, at which time there was no further dilatation. It was then decided to deliver the patient by vaginal cesarean section.

March 23, 1921. Vaginal cesarean section. Anterior incision. Internal podalic version and breech extraction of a 5½-months, macerated fetus. Manual extraction of the placenta. Puerperium.

The patient made an uneventful recovery. The temperature and pulse remained within normal limits. She had no bladder symptoms, and was comfortable during the entire convalescence.

April 8, 1921. Discharge Note: The cervix and the anterior wall are well healed. There is no bulging of the walls. The uterus is well involuted and in excellent position. It is freely

movable. There are no masses or areas of tenderness in the pelvis. The blood-pressure is 135/80, and the urine is negative, except for a rare hyaline cast.

CONCLUSIONS.

1. Vaginal cesarean section is an ideal operation when an indication for immediate delivery arises in a patient with a long, rigid, undilated cervix, up to the eighth month of pregnancy.
2. The operation may be done at term, as shown by Case No. 1 of this series; but here the difficulties are greater, and there is danger of the incisions tearing in the peritoneal cavity because of the large size of the child.
3. There are remarkably few bladder symptoms, considering the fact that this organ has to be separated from the anterior vaginal wall as well as from the uterus.
4. Since the operation is extraperitoneal, post-operative distention is a negligible factor.
5. The puerperium, as a whole, resembles that of any operative pelvic delivery.

BIBLIOGRAPHY

- A. Dührssen, Berlin, *Der Vaginale Kaiserschnitt*, 1904.
 A. Dührssen, Berlin, *Berliner Klinische Wochenschrift*, lvi, 752, 1920.
 A. Ribemont-Dessaignes et G. Lepage, *Traité d'Obstétrique*, page 1204, 1914.
 Joseph B. DeLee, *The Principles and Practice of Obstetrics*, page 916, 1914.
 J. Clifton Edgar, *The Practice of Obstetrics*, Fifth Edition, page 1003.
 Edwin Bradford Cragin, *Obstetrics*, page 782, 1916.
 Barthelemy Cook Hibel, *Atlas of Gynecology*, page 137, 1919.
 J. Whitridge Williams, *Obstetrics*, page 413, 1910.

Medical Progress.

PROGRESS IN PEDIATRICS.

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A SUMMARY OF THE LITERATURE OF THE LAST FEW YEARS ON RICKETS.

UP to a few years ago little more was known about the etiology of rickets than was known when it was first described many years ago. Advance began to be made about five years ago, and during the last two years much has been learned about it, although the matter is not by any means as yet settled. Much of this advance has been due to better chemical methods, and more to the attention called by Howland and Park¹ to the fact that a definite correlation exists between the Roentgen ray signs and the actual pathological conditions in the bones.

Findlay², in a report of the Medical Research Committee of the English National Health Insurance Council in 1918, after giving a fairly complete historical review of the subject, came to certain conclusions, of which the following seem the most important: rickets generally develops in late

winter and spring; the age at which artificial feeding is commenced seems to be of little moment; a defective supply of fat cannot be considered as playing an essential part in the causation of rickets; the evidence is against the fat-soluble A being a determining factor; the social conditions of the rachitic family are not as good as of the non-rachitic; the average number of persons per room is greater, the air space 32% less and the house more dirty in the rachitic families. That is, he believed that the frequency of rickets varied with the housing conditions. This point of view represented fairly well the general belief at that time.

FAT-SOLUBLE A AND ANTIRACHITIC VITAMIN.

Mellanby³, in 1919, fed puppies on various diets which always brought on rickets. He found that the addition of yeast and orange juice to the diet did not prevent its development. Meat and extracts of meat had an inhibitory action, apparently largely because of the extractives which they contain. The addition of fats prevented its development. In order of value they were cod liver oil, butter, animal fat and vegetable fat. He concluded that rickets was a deficiency disease which develops in consequence of the absence of some accessory food factor or factors. The antiscorbutic and water-soluble B can be excluded. Therefore, it must be due to the lack of an antirachitic factor, which is either the fat-soluble A, or one which has a somewhat similar distribution.

He found, as has been proved many times since, that rickets develops more quickly in rapidly than in slowly growing animals. He admits that this association is rather against A as the cause, as A is essential for growth. His explanation is that only a small amount of A is necessary to promote growth, but considerably more is required to insure correct growth. He explains the action of protein in preventing rickets by its stimulating action on the metabolism and the consequently better utilization of A. He showed that both human and animal milk might be deficient in A, if the food was deficient in it.

In a later paper⁴, he stated that vegetable oils contain more or less antirachitic factors, although experiments on rats seem to show that A is absent. He criticised Hess and Unger for their conclusions on giving cottonseed oil and said that the high protein in their diets would tend to prevent rickets.

The Accessory Food Factors Committee of the Medical Research Council of Great Britain accepted Mellanby's conclusions and reported⁵, that rickets was a deficiency disease due to the lack in the diet of substances rich in an antirachitic factor and containing an excess of those deficient in this factor.

Mellanby's conclusions did not go unchallenged and were the cause of much experi-

mental work in England and this country. Paton, Findlay and Watson⁶ had already found that puppies sent to the country did not develop rickets, even when given skimmed milk, while puppies kept in the laboratory did develop it, whether confined or running about. They also found that puppies that were kept in the laboratory, whether confined or not, developed rickets, even if they were given butter. The most marked case was in one that took butter. They concluded that some other factor than diet is the prime cause of rickets and that there is no evidence that milk-fat contains any accessory factor which protects against the development of rickets.

Hess and Unger⁷, in order to provide an adequate amount of the fat-soluble vitamins, placed a number of infants during the first months of their lives on large amounts of milk, in some instances giving cream in addition. If the fat-soluble vitamin was the controlling influence, rickets should have been prevented. Various degrees of rickets developed, although the babies did not show signs of indigestion. They conclude that these results apparently show that the lack of the fat-soluble vitamin is not the cause of rickets. They admit that their conclusion may be criticised on the ground that the milk was deficient in the fat-soluble vitamin, because of a lack of it in the fodder given to the cows. They admit that rickets is less severe in the summer, but say that this does not prove that the presence of more fat-soluble vitamin is the cause of the improvement. This would not account for the large number of babies that develop rickets while taking an abundance of milk, or for the breast-fed babies who develop the disease while the mother is taking an abundance of the fat-soluble factor.

They also put five infants between four and nine months of age on a dietary, complete in every respect, except for a lack of fat-soluble vitamin, and kept them on this diet for from five to nine months. These babies showed no greater signs of rickets than the average baby in the institution, which, they believe, shows that this vitamin is not the much-sought-for antirachitic factor.

Paton and Watson⁸ then undertook another series of investigations on puppies, and found that under ordinary laboratory conditions a liberal allowance of milk-fat, 14 grams per kilo, neither prevented the onset of rickets nor cured it when it had developed. They also found that pups kept largely in the open might escape rickets on an intake of milk-fat as low as one gram per kilo. They also found that pups could be reared in the laboratory, if scrupulous care as to cleanliness was exercised, without developing rickets on 0.5 gram per kilo, if the energy value of the diet was normal. They found that if lard, which is supposed to lack the fat-soluble

A, was given in place of milk-fat, rickets did not develop.

Mackay⁹ conducted a short series of rather inconclusive experiments on kittens that were given a diet deficient in fat-soluble A. Tozer found no changes of rickets in the bones of these animals.

McCollum, Simmonds and Parsons¹⁰ constructed a number of diets which produced rickets or other bony changes in rats. These diets were deficient in some particular or other and could be made to produce normal growth, if this deficiency was made up. This was merely a preliminary communication and they did not dare to draw any positive conclusions as to the absence of a specific antirachitic substance or a deficiency of either fat-soluble A or calcium as the primary agent in the causation of rickets. They say, however, that "at present it is only possible to say that the etiological factor is to be found in an improper dietetic regimen."

Shipley and Park¹¹, in a series of experiments on rats, found that a deficiency of fat-soluble A alone did not produce the bony changes of rickets, while one deficient in both fat-soluble A and the phosphate ion did produce it. They conclude that a deficiency in fat-soluble A cannot be the sole cause of rickets, but think that the fat-soluble A may determine in part the level of the blood phosphate and thus play a part in the development of rickets.

Hess, McCann and Pappenheimer¹² fed rats on a complete ration, including yeast and orange juice, except for an almost total lack of the fat-soluble A. A control series which was given the same diet, with enough butter fat to make it complete, grew well and did not develop keratitis. The first series ceased to grow, developed keratitis and died prematurely. There were no gross evidences of rickets. Microscopic examination of the bones of 22 rats showed definite signs of a lack of active osteogenesis, but in no instance lesions resembling rickets. They conclude that the fat-soluble A cannot be regarded as the antirachitic vitamin. If the diet is otherwise adequate, its deficiency does not bring about rickets.

SEASONAL VARIATION, ULTRAVIOLET RAYS AND SUNLIGHT.

Hess¹³, early in 1921, emphasized the seasonal incidence of rickets, calling attention to the increased incidence and intensity in the spring, and its tendency to fall to the lowest level in late summer and autumn. In the Home for Hebrew Infants, of which he has charge, rickets almost disappears in August and September.

Hess and Unger¹⁴ state that there are two possible explanations for the increase of rickets during the winter and early spring, and its decrease during the summer months, namely,

change in climate and alteration in the food. In order to determine whether rickets is due to some difference between the milk of winter and of summer, they fed some babies on dried summer milk and some on the dried milk of stall-fed cows. There was no difference in the incidence of rickets in the two series, showing that it is not due to differences between winter and summer milk. Incidentally their investigation shows that dried milk, *per se*, does not cause rickets.

In 1917 they made the first attempt to cure rickets by means of the ultraviolet rays, on the basis that if "season" was to be interpreted as a climatic influence, in which the sun plays an important rôle, artificial actinic rays might bring about a similar effect. Their results were inconclusive, but were not checked by the Roentgen ray.

Huldschinsky¹⁵ in 1920, reported favorable results with these rays, but as he also gave calcium phosphate and cod liver oil, his results are inconclusive. Hess and Unger¹⁴ again used the ultraviolet ray therapy and checked their results with the Roentgen ray. They exposed the entire body, at first for three minutes and later for twenty minutes, three times a week, for two months, in six babies, putting the lamp 120 cm. from the body at first, and finally 75 cm. roentgenograms showed definite improvement in all cases, that is, a definite deposition of salts at the epiphyseal ends of the bones. No changes were made in the diet and the treatment was given in February and March. They believed that the effect was systemic and not merely the result of a local action on the epiphyseal ends of the bones.

They state that these results elucidate the seasonal variation of rickets, explain why rickets preponderates in large cities, where the infants are closely housed during the winter, and emphasize the importance of sunlight in comparison with fresh air and exercise. They suggest that the marked incidence of rickets in negroes may be due to the color of their skin, which interferes with the penetration of short actinic rays.

Putzig¹⁶ corroborated Huldschinsky's results in premature infants, and Riedel¹⁷ also treated 100 children with good results.

Erlacher¹⁸ gave 42 children with rickets from 40 to 60 daily treatments, some as long as 15 minutes, with the ultraviolet rays. There was no medicine given and no change made in the diet or life of the babies. Clinical improvement was evident in from four to six weeks. Roentgenograms showed definite ossification. The bones became harder and stronger, and improvement went on to complete healing. He concluded that the action must be a general one, because improvement occurred in the same way in bones which were not exposed.

Hess, Unger, and Pappenheimer¹⁹ placed rats

on a diet which invariably caused rickets. One set was kept in absolute darkness, another was taken out and exposed to direct sunlight 15 to 30 minutes, four or five days a week. The diet was the same in both groups. They were x-rayed after three weeks and killed and autopsied after from 30 to 40 days. The rats exposed to the sun did not show any signs of rickets. This was the first time that rats on this diet, even though kept in the well-lighted laboratory, had not shown it. They also found that it was possible to prevent the development of rickets on this diet by the addition of potassium phosphate.

Shipley, Park, Powers, McCollum and Simmonds²⁰ put 18 rats on a rachitic diet. Twelve were exposed to sunlight from 20 minutes to six hours, for from 62 to 67 days. The average exposure was four hours a day, and the total from 242 to 273 hours. Six were kept in an ordinary room with glass windows. The rats which were exposed to sunlight did not develop rickets. The rats that were kept in did. Their results were proved by autopsies and microscopic examinations. Incidentally, their results, as well as those of Hess, Unger and Pappenheimer, show that ordinary window glass prevents the curative and preventive action of sunlight on rickets.

They found that the changes produced in the skeleton by sunlight did not differ in any important respect in either time or character from those produced by cod liver oil. They state that "Both contain something which is essential for optimal cellular function." "They permit the organism to put into operation adaptations or defense mechanisms, which otherwise would have been ineffectual. Neither cod liver oil nor light meets the defects in the composition of the diet by supplying to the body either calcium or phosphorus, but meets them indirectly by so raising the potential of cellular activity as to secure the most efficient utilization possible of those substances available in the body which are directly or indirectly concerned with ossification and calcification."

Hess and Unger²¹, encouraged by their results with the ultraviolet ray, attempted to attain similar results by the direct action of the sun's rays. They exposed, in turn, the legs, arms, trunk and face of five infants, from six to eighteen months of age, for from one-half hour to several hours daily, weather permitting. There was a marked improvement in every case, as evidenced by the calcification of the epiphyses, noted by means of the Roentgen ray. The alterations resembled those seen after the administration of cod liver oil. In one case they were evident in 13 days. In one case improvement was shown in both wrists, although but one arm had been exposed. The action of sunlight must be, therefore, systemic, not local. The general condition of the

babies also improve. The diet was not altered during the treatment. They conclude²² that the seasonal incidence of rickets is due to the seasonal variation of sunlight, and that sunlight should be used both to prevent and to cure infantile rickets.

Hess and Gutman²³ found that rickets could be either prevented or brought about according to whether animals were subjected for a short period to the sun's rays or at all times kept in the dark. They believe that the ultraviolet rays play a large rôle in the curative power of the sun. They state that Howland and Kramer²⁴ have found that the serum of infants with active rickets contains a diminished amount of inorganic phosphate and that during the progress of healing, following the administration of cod liver oil, the phosphate content gradually rises to the normal level. They exposed seven infants with rickets to direct sunlight from one-half to several hours daily, sometimes exposing only the arms and legs, at others the trunk also. The diet was unchanged. They did not trust entirely to the Roentgen rays to demonstrate the improvement which took place, as babies may have clinical signs of rickets and a low inorganic phosphate of the blood with normal bony contours of the wrists and elsewhere. The inorganic phosphate of the blood increased from month to month and gradually reached the normal level of about 4 milligrams, that is, the results obtained were similar to those with cod liver oil.

METABOLISM AND CHEMISTRY OF RICKETS. CALCIUM AND PHOSPHORUS.

Mayer²⁵ found that the calcium content of the serum is constant in healthy infants, varying slightly with the individual infant. It is uninfluenced by food or age. Its height is almost the same as in adults, averaging 11.25 mg. per 100 c.cm. of serum. In the acute stage of rickets this is slightly or much increased; in the course of convalescence it sinks quickly far below normal and then gradually returns to normal. This change takes place very quickly under treatment with the ultraviolet rays, more quickly than when calcium phosphate and cod liver oil are given.

Findlay, Paton and Sharpe²⁶ found, as was known before, that "Changes in bones, simulating somewhat those in rickets, can be caused by feeding on a calcium low diet, but the condition is one of osteoporosis and not true rickets. The tissues other than bone, in experimental rickets in dogs, are not deficient in calcium. The calcium content of the blood shows no divergence from the normal. No support is given to the view that rickets is due to a deficient supply of calcium to the bones."

Grosser²⁷ made a metabolic study of 10 infants injected parenterally with different calcium and phosphorus compounds on comparable diets, to learn which of the calcium salts are

most readily assimilated by the child with a tendency to rickets. He did not draw any general conclusions.

Phemister²⁷ studied the action of phosphorus on the growth of bone in various conditions, including rickets, and reviewed the literature. Phemister, Miller and Bonar²⁸ did some experimental work on animals. They then studied a few children with rickets with the aid of the Roentgen ray, giving cod liver oil and phosphorus to some and phosphorus alone to others. Improvement was as rapid in the cases in which phosphorus was given alone as when it was combined with cod liver oil. They state that their results suggest that phosphorus may be as efficient as cod liver oil. They do not think that the trace of phosphorus which is present in cod liver oil is sufficient to exert any influence. The improvement, when phosphorus was given, could not be due to fat-soluble A. They do not attempt to explain the action of phosphorus.

Shipley and Park²⁹ fed one series of rats on a diet deficient in both fat-soluble A and phosphorus, and another series on one entirely deficient in fat-soluble A. The latter group developed no bony changes resembling rickets. Many of the first group developed changes resembling those in human rickets. These results suggested to them that "the phosphate ion may be a determining influence for or against the development of rickets." Their results show that "if the phosphate ion is sufficiently high, a deficiency of fat-soluble A cannot cause ricket-like changes in the skeleton." They think that the fat-soluble A may determine, in part, the level of the blood phosphate and thus play a part in the development of rickets.

Sherman and Pappenheimer³⁰ produced rickets in rats by a diet very deficient in many ways, especially in fat-soluble A. The addition of 0.4% of potassium phosphate prevented the development of rickets.

McCollum, Simmonds, Shipley and Park³¹ fed rats on a ration deficient in phosphorus and fat-soluble A but containing the optimal amount of calcium. These rats lost weight and had xerophthalmia. Changes of rickets were found both in gross and microscopically in all. Rats were fed on the same ration with a small amount of butter in place of dextrin. This supplied some fat-soluble A, but not enough to prevent xerophthalmia. These rats lived longer and showed more marked evidence of rickets. Another series of rats were fed on a ration low in phosphates and fat-soluble A, but with twice the optimal amount of calcium. They gained slowly or not at all, and did not develop xerophthalmia, but showed extreme rachitic changes. The rats in the second group probably showed more rickets because they lived longer. They think the greater degree of rickets in the third group was due to the higher calcium-phosphate ratio. They

conclude that, "Apparently . . . in rats, rickets may be produced by disturbances in the diet of the optimal ratio between calcium and phosphorus in the absence of an amount of an organic substance contained in cod liver oil sufficient to prevent it." "The physiological relation in the diet between the two is of . . . greater importance than the absolute amount of the salts themselves."

Howland and Kramer³² state that rickets is a disease characterized by a deficient deposition of calcium salts in the bones themselves and in the intercellular cartilage of the epiphyses. Inasmuch as the salts of the bones consist preponderantly of calcium phosphate, it would appear likely that the concentration of calcium and phosphate in the circulating medium must play an important part in the determination of precipitation. Their experience, based on more than 2000 determinations, leads them to the following conclusions: The calcium content of the serum in the human is singularly constant, being slightly higher in children, namely, 10 to 11 milligrams. There is a striking diminution in two diseases, tetany and nephritis. There is no demonstrable amount of calcium in the red cells. They call attention, however, to the fact that others differ from them on this point. They determined only the inorganic phosphorus of the serum. This represents the orthophosphate content of the serum, the only form of phosphate which can react with calcium to form tertiary calcium phosphate, which equals 85 to 90% of the salts of bone. The average in non-rachitic babies is 5.4 milligrams per 100 cc. of serum.

The diagnosis of rickets made on clinical grounds was supported by roentgenograms in twenty-two cases. The phosphorus varied from 0.6 to 3.2 milligrams per 100 cc., with an average of 2.0 milligrams less than 50% of normal. The calcium was within normal limits in twelve of twenty-five cases. In the others it was but little diminished and probably because of tetany. They say that a deficiency of calcium in the serum cannot, therefore, be looked upon as the primary reason for the failure of calcium deposit. Under treatment with cod liver oil the phosphorus rose to normal limits, and healing of the bones took place. They state that "In rickets we believe, therefore, that there is a marked and, for the causation of the pathological lesion, an important deficiency in inorganic phosphorus. To this deficiency is to be ascribed the failure of calcium deposition." They state that the ratio of the concentration of calcium to that of phosphorus in the serum of non-rachitic infants is practically the same as in tricalcium phosphate, which makes up nine-tenths of the salts of bone. A diminution in phosphorus would, therefore, render difficult the precipitation of this salt. The calcium salts in blood are in nearly saturated solution. No increase in the blood content of

calcium can, therefore, be brought about by feeding calcium salts.

COD LIVER OIL.

Shipley and Park²² fed eight rats on a diet very low in fat-soluble A, and seven on one low, not only in A, but in calcium, sodium and chlorine ions. Both of these diets are known to make the epiphyseal cartilages and adjacent portions of the metaphyses calcium free. When the rats on the first diet began to develop xerophthalmia, cod liver oil was given in place of part of the dextrin of the diet to four of them for two, four, seven, and eight days respectively. The other four were given no oil and were kept as controls. Cod liver oil was added to the diet of three of those on the second diet, 1% replacing 1% of maize, for three, five, and five days respectively. The other four were kept on the diet as controls.

The cartilages of the controls were free from calcium. There was a deposition of calcium, as shown by the microscope, in three of the second set, and in all of the first set that were given cod liver oil. They consider that their results admit the following generalizations: "When the cartilage has become free from lime salts as the result of the deficient diets, the addition of cod liver oil to the food for a period of from two to seven days is followed by the deposition of lime salts between the cells of the proliferative zone of cartilage." They give further data to show that the process is like that of healing in rachitic bones.

Park and Howland²³ studied fifty cases of rickets in children that were kept in the hospital without change in the diet. After treatment with cod liver oil changes were detected in the bones by radiograms about the end of the third or fourth week, or a little before. The deposition of salts occurred sooner in cases in which the disease was just entering the stage of repair. So much infiltration of salts took place in two or three months that the extremities of the bones, except for deformities, appeared normal. They say, "We look upon cod liver oil as a specific for rickets." "We have not seen it fail in any single instance and we have known it to cure the rickets even though the children were dying of some other disease."

COMMENT.

In spite of all the investigations detailed above as to the etiology of rickets, very little knowledge of practical value for everyday use has been gained, although the outlook for the final solution of the problem is far brighter on account of this work than it was before. It has apparently been proved, as was previously supposed, that rickets is not due to a deficiency of calcium and that it is useless, therefore, to give calcium salts in the treatment of this disease. It seems evident that rickets may de-

velop as the result of poor environment or of some defect in the food, that is, there is a basis for both of the divergent views which have been so long held as to its origin. Lack of sunlight is apparently the most important, if not the only element, in poor environment. The etiological defect in the diet is apparently neither an excess nor a deficiency of any one of the food elements,—fat, carbohydrates, or protein. It is evidently not a lack of vitamin A, but it is possible that there may be some relation between this vitamin and the real cause. A deficiency of phosphorus or an abnormal relation between the phosphorus and calcium may, perhaps, be the cause. It seems more probable, however, that the cause may be a deficiency of some unknown factor or factors, which stimulate or regulate the metabolic processes especially concerned with the salts of calcium and phosphorus.

These recent investigations have shown that there is a real basis for the empirical teachings of the past that out-of-doors, phosphorus and cod liver oil were of use in the treatment of rickets. They leave us somewhat in the dark, however, as to how to prevent it. It would seem, sunlight being beneficial only when it strikes directly on the body, as if it was not sufficient to keep babies in airy, sunny houses, but that their naked bodies must be wholly or partly exposed to the sun's rays. It will be rather difficult to persuade the average mother to do this regularly in the winter as a preventive, although she will probably do it gladly as a curative measure. These investigations show us little or nothing as to how a baby should be fed to prevent the appearance of rickets. It still seems safe, however, to follow the old teachings that human milk is the best food for babies, and, next to it, some modification of cow's milk. It may be that the time will come when all babies will be given cod liver oil as a preventive. It seems evident, at any rate, that cod liver oil will cure rickets. As it is the easiest and simplest method, it would seem to be the one of election. Phosphorus also seems to have a definite curative action. Phosphorus is, however, a dangerous drug and the limits of its dosage narrow. It is, therefore, inferior to cod liver oil for ordinary use.

REFERENCES.

- ¹ Journ. Amer. Med. Ass., 1920, lxxx, 198.
- ² Report No. 20 of the English Nat. Health Insurance Med. Research Committee, 1918.
- ³ Lancet, 1919, i, 407.
- ⁴ Proc. Royal Soc. of Med., 1920, xiii: Diseases of Children, 57.
- ⁵ Report No. 23 of the Eng. Nat. Health Insurance Med. Research Committee, 1919.
- ⁶ British Med. Journ., 1918, ii, 625.
- ⁷ Journ. Amer. Med. Ass., 1920, lxxiv, 217.
- ⁸ British Med. Journ., 1921, i, 594.
- ⁹ Biochem. Journ., 1921, xv, 19.
- ¹⁰ Journ. Biol. Chem., 1920-21, xiv, 323.
- ¹¹ Johns Hopkins Hosp. Bull., 1921, xxxii, 160.
- ¹² Journ. Biol. Chem., 1921, xlvii, 205.
- ¹³ Journ. Amer. Med. Ass., 1921, lxxvi, 693.
- ¹⁴ Amer. Journ. Dis. Child., 1921, xxii, 180.
- ¹⁵ Ztsch. f. orthop. Chir., 1920, lxxix, 436.
- ¹⁶ Therap. Halbmonatschr., 1920, viii, 234.

- ¹⁷ Munchen. med. Woch., 1920, lxxvii, 838.
¹⁸ Wien. klin. Woch., 1921, xxvii, 341.
¹⁹ Proc. Soc. Exp. Biol. and Med., 1921, xix, 8.
²⁰ Proc. Soc. Exp. Biol. and Med., 1921, xix, 48.
²¹ Journ. Amer. Med. Ass., 1921, lxxvii, 39.
²² Proc. Soc. Exp. Biol. and Med., 1921, xviii, 398.
²³ Journ. Amer. Med. Ass., 1922, lxxviii, 39.
²⁴ Archiv f. Kinderheilk., 1921, lxx, 176.
²⁵ Journ. Amer. Med. Ass., 1921, lxxvii, 1051.
²⁶ Ztsch. f. Kinderheilk., 1920, xxv, 141.
²⁷ Journ. Amer. Med. Ass., 1919, lxx, 1787.
²⁸ Journ. Amer. Med. Ass., 1921, lxxvii, 850.
²⁹ Proc. Soc. Exp. Biol. and Med., 1920-1921, xviii, 102.
³⁰ Journ. Biol. Chem., 1921, xlvii, 507.
³¹ Amer. Journ. Dis. Child., 1921, xxii, 108.
³² Journ. Biol. Chem., 1920-21, xiv, 343.
³³ Bulletin Johns Hopkins Hosp., 1921, xxxii, 341.

New England Health Institute.

Under the auspices of United States Public Health Service; Connecticut State Department of Health, Maine State Department of Health, Massachusetts Department of Public Health, New Hampshire State Board of Health, Rhode Island State Board of Health, Vermont State Board of Health, Yale Medical School, Harvard Medical School.

Director: John T. Black, M.D., Hartford, Conn.

The largest and most comprehensive Health Institute ever arranged for New England will be held in Hartford, Conn., May 1-6, 1922. This Institute has been prepared under the direction of the State Boards of Health of New England, Yale and Harvard Medical Schools and the United States Public Health Service.

This meeting will not be a convention but rather, as the name implies, a school of public health. Every effort will be made to present health problems in such a manner that the information given can be practically applied.

SCHEDULE OF COURSES.

1. Health Administration, Professor C.-E. A. Winslow, chairman. Nine lectures.
2. Preventable Diseases, Professor M. J. Rosenau, chairman. Nine lectures.
3. Sanitation, James A. Newlands, chairman. Nine lectures.
4. Tuberculosis, Dr. Stephen J. Maher, chairman. Five lectures.
5. Venereal Diseases, Dr. Howard A. Streeter, chairman. Eight lectures.
6. Child Hygiene, Dr. Merrill E. Champion, chairman. Nine lectures.
7. Public Health Nursing, Anne H. Strong, chairman. Eight lectures.
8. Social Work, Dr. Valeria H. Parker, chairman. Seven lectures.
9. Mental Hygiene, Dr. Paul Waterman, chairman. Four lectures.
10. Industrial Hygiene and Accident Prevention, Dr. George E. Tucker. Seven lectures.
11. Foods and Food Control, Hermann C. Lythgoe, chairman. Eight lectures.
12. Nutrition, Dr. Fritz B. Talbot, chairman. Four lectures.

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The headquarters of the Institute and the lecture halls will be in the Hotel Bond, 320 Asylum street, Hartford. Any person engaged in or interested in health work may take such courses or individual lectures as he may select. A certificate will be given to those who attend at least two complete courses or a total of twenty selected lectures. All lectures and courses are given without fee and no registration charge is made. The only charge of the week will be a cover charge for Thursday evening. Lecture hours will be from 10 A. M. to 12 o'clock noon, and from 3 P. M. to 5 P. M. daily, except Saturday, which will be devoted to field work. Forty-five minutes of each hour will be devoted to the lecture, ten minutes to questions and five minutes to assembling. Seats will be reserved for those who

register for regular courses. Bulletins will be issued from time to time, supplying information as to hotels, train schedules, road conditions and other matters of interest. Registrations should be filed as early as possible, but not later than April 15. For registration and information concerning the Institute, address John T. Black, M.D., State Commissioner of Health, Hartford, Conn.

THE MASSACHUSETTS DEPARTMENT OF PUBLIC HEALTH.

REPORTED WEEK ENDING MARCH 25, 1922.

Disease	Cases	Disease	Cases
Anterior poliomyelitis	4	Mumps	98
Chicken-pox	111	Ophthalmia neonatorum	26
Diphtheria	158	Scarlet fever	214
Dog-bite requiring antirabic treatment	2	Septic sore throat	3
Encephalitis lethargica	7	Syphilis	43
Epidemic cerebrospinal meningitis	2	Suppurative conjunctivitis	13
German measles	9	Tuberculosis, pulmonary	143
Gonorrhea	96	Tuberculosis, other forms	16
Influenza	190	Typhoid	8
Measles	595	Whooping-cough	129

REPORTED WEEK ENDING APRIL 1, 1922.

Disease	Cases	Diseases	Cases
Anterior poliomyelitis	2	Ophthalmia neonatorum	16
Chicken-pox	102	Pneumonia, lobar	154
Diphtheria	143	Scarlet fever	201
Dog-bite	1	Septic sore throat	4
Euccephalitis lethargica	5	Syphilis	51
Epidemic cerebrospinal meningitis	3	Suppurative conjunctivitis	9
German measles	17	Trachoma	2
Gonorrhea	81	Tuberculosis, pulmonary	155
Influenza	96	Tuberculosis, other forms	23
Malaria	1	Typhoid fever	7
Measles	671	Whooping-cough	99
Mumps	102		

RETURN OF THE TUBERCULOSIS PATIENT TO INDUSTRY.

DR. JOHN B. HAWES, 2d, President of the Boston Tuberculosis Association, has appointed a committee which will study the problem of finding occupations for the men and women who have had tuberculosis. The Association plans to obtain the services of a high-grade woman, whose duty it will be to get in touch with the patients before they are discharged, to find out their physical condition, their capacity for work, their former occupation, to get in touch with their former employer and to try to arrange it so that the man or woman in question can go back to his, or her, work gradually, starting with a few hours a day and working up to a full day's time. An attempt will likewise be made to get the coöperation of the leading manufacturers and employers of labor in this city and secure endorsement of this plan. The American Woolen Company has retained Dr. John B. Hawes, 2d, as consultant in dealing with the tuberculosis problem among the employees of that company.

THE BOSTON Medical and Surgical Journal

Established in 1822

Published by The Massachusetts Medical Society under the jurisdiction of the following-named committee:

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SUBSCRIPTION TERMS: \$5.00 per year in advance, postage paid for the United States, \$7.50 per year for all foreign countries belonging to the Postal Union.

Material for early publication should be received not later than noon on Saturday. Orders for reprints must be sent to the printer with galley proof of paper. Upon written request, authors will be furnished free one hundred eight-page reprints, without cover, or the equivalent in pages in articles of greater length. The Journal does not hold itself responsible for statements made by any contributor.

Communications should be addressed to The Boston Medical and Surgical Journal, 225 Massachusetts Ave., Boston, Mass.

DR. BARKER ON GROUP MEDICINE.

The organization of medical men into groups for the practice of medicine has been steadily increasing in certain parts of this country. In New England very little has been done in this direction, unless it can be said that the large hospitals, with their numerous consultations between members of the Staffs, practise group medicine.

This experiment, for such it is, excites our interest; it will not be long, we predict, before such groups will be formed in Boston. Without doubt, group medicine has definite advantages, but these will be of no avail unless certain fundamental principles in the practice of medicine are kept clearly in mind. Three, at least, of these are essential: each case must be studied carefully and scientifically, and the knowledge so gained must be applied to the patient's advantage; the patient must have confidence in the physician who has the management of his case; the cost of the examination and of the treatment must not be excessive.

One might well ask whether any of these principles are carried out by the plan suggested by Dr. Lewellys Barker in his otherwise excellent article on "The Specialist and the General Practitioner in Relation to Team-work in Medical Practice," which appeared in the *Journal of the American Medical Association* of March

18, 1922. In discussing group medicine, Dr. Barker finds in it, as it is frequently practised, the danger that the results of examinations by various specialists will not be so co-ordinated that the right thing will be done for the patient. To prevent this unfortunate state of affairs, he suggests that groups should have "diagnostic integrators"—"men with more than ordinary endowment in what is called 'common sense',"—who will digest, so to speak, the reports of specialists, and from them evolve a theory of treatment.

A chart presented by Dr. Barker shows the route which the patient of a group so equipped would follow. He would first be examined by an internist, who takes his history and gives him a general going-over. From there he would go to a "consulting diagnostician," who checks the main findings and decides what special examinations are needed. These examinations made, the reports are collected by a compiling secretary, who hands them to a "diagnostic summarizer." The latter rearranges the data on a single sheet and presents this evidence to the "diagnostic integrator" and the "therapeutic planner." These dignitaries (what else shall one call them?) may be one and the same man, or may be two individuals. At any rate, they, or he, constitute the final Court of Appeal; they exercise that "more than ordinary common sense" to which they owe their position, and having decided what shall be done for the patient, they turn him back for treatment to the general practitioner or to the appropriate specialist.

This is group medicine as advocated by Dr. Barker. We doubt if such an organization exists, or ever will exist. To use a phrase borrowed from "big business," the "overhead" would be too great. This plan, if put into effect, would create an organization so topheavy that it would capsize in the very first storm. Picture the bewilderment of the patient as he, or even more as she, is being ground up in this medical mill. There would be no chance for the development of any personal relations between doctor and patient, although Dr. Barker admits that personal relationships are exceedingly "important in medicine."

The whole group revolves around the "diagnostic integrator." The others need not think, for that is his job. Yet he will be too busy to do the thinking and to get that intimate point of view without which many cases cannot be properly diagnosed. The scheme would result in the development of a few vastly overworked diagnosticians, surrounded by a coterie of men who would be expert in some method of examination, but who would not be physicians in the true sense of the word.

The plan appears to us to be inhuman, unwieldy, extravagant. We vote for the present

system, in which responsibility is put squarely up to the man whom the patient selects for his physician. Every medical man should be able to tell what organ or what system of organs is chiefly involved. If he has not the facilities or the knowledge needed to investigate that particular portion of the body, let him select as a consultant that man in the community who can best help him, and not be confined in his choice to the members of a group. It may be that of several possible consultants, one is especially suited for one type of case, another for another.

The patient will then have a friend as well as a physician, to whom he may turn for advice. Is the mental side of medicine to be neglected altogether, or to be administered only by those who have studied Freud?

Let us not depart too far from the ideals set before us by Fitz, Osler, and by all of the great physicians who have made medicine what it is. The practice of medicine is still a profession and an art.

RURAL MEDICAL SERVICE.

THIS subject has engaged the attention of physicians, health authorities and writers in the daily press to a considerable extent. Opponents of requirements for higher standards of premedical education have argued most earnestly against any legal enactment of regulations relating to preparatory courses. The contention is made that higher standards would tend to reduce the number of physicians who might be inclined to settle in smaller towns, and the statement has been made that there is a scarcity of physicians.

There is abundant evidence that there is a dearth of physicians in small and remote towns, but the real reason for this shortage seems to have been overlooked, for it does not lie in an inadequate number of physicians. In this country there is, on the average, one physician to about eight hundred persons, but in England and Germany, for example, there are approximately half as many physicians in proportion to the population as are found on the average in the United States. The real reasons for inadequate medical service are probably economic and personal. The general trend of the times is for physicians to share in the common ambition for better living conditions and social advantages. An appreciable number of doctors who engaged in government service during the war, upon release from military duty, took occasion to seek more attractive fields, with the result that, in common with the younger graduates, attempts were made to develop practice in the larger towns or cities.

A few men have claimed that public health activities have reduced the demands for pro-

fessional service. This is certainly true to an extent, for it is perfectly well known that a generation or two ago the average country practitioner was employed in caring for more cases of typhoid fever and tuberculosis than is the case today. Typhoid fever is the vanishing disease, and consumption is less prevalent than it was. Many tuberculosis cases are cared for in sanatoria and are either cured or spend so much time in institutions that the long attendance by physicians is not so often required.

Some argue that the graduates of the low-grade medical schools would fill the needs of the small communities. This is probably not true to any extent, for the poorly equipped doctor can often succeed better in the large cities, for his antecedents and associations are not so well scrutinized by many in a city. To the uneducated citizen, a doctor's sign means only a doctor and, thanks to Nature's laws, many people recover from illness with or without a physician's attendance; but to some the recovery is evidence of skillful service. In a small community there are intelligent people who would soon know all about a physician's equipment, and if he should be unable to measure up to average standards, the fact would be common property in a short time. Sometimes the inefficient doctor who succeeds financially in small communities, is the one who adopts the customs of the pretenders and is able to deceive a part of the people for a part of the time.

Some of the objections to higher grade medical education have been presented by representatives of a cult on the plea that nothing should be done to reduce the number of doctors, but one seldom hears of an osteopath or chiropractor settling in a small town or striving to meet the needs of a community for a general practitioner.

Various suggestions of possible remedies have been published, but in the last analysis doctors will not find rural service attractive unless there is a reasonable guarantee of desirable living conditions and returns. In the changing conditions which affect medicine the education of the people plays an important part, for the general understanding of the skill of the specialist leads many in the remote towns to go more or less regularly to cities for expert opinions and service. This custom also depletes the income of the local doctor.

But, after all, the honest, resourceful physician will often build up a fairly good living in smaller places if he has the physique to withstand the strain of hard work and irregular hours, but he must not be too modest nor belittle his ability to meet the competition of others. It has been said that one of the reasons for lack of income results from the indis-

position of some doctors to pay satisfactory attention to minor or functional ailments. It may be that physicians do not always put into practice business methods, that is, do not meet the wishes of patients, for a person who suffers with minor disorders may be willing to pay for relief, and if the service is not forthcoming, may make regular trips to a city for sympathetic manipulations. Chiropractors have said that if doctors cured their patients, there would be no demand for chiropractic treatment.

It has been suggested that a lucrative field of practice has not been generally developed and that people might be easily taught to consult doctors before the evidence of ill health appears, and a physician's income could be augmented by keeping his patients well. Surgeon-General Ireland has advanced the idea that regular physical surveys of soldiers should be employed and, if desirable in the army, it is equally so in civil life. Insurance companies are devoting attention to this plan with marked success.

The really useful man in the country towns should have good training as well as natural ability, for he is often unable to have assistance in grave emergencies and he should be the adviser of all the people on health matters. The inefficient doctor is as much out of place in the country as in the city. He should have sustaining courage and he may comfort himself in the recollection that, like McDowell, many a man away from medical centers has contributed important knowledge to the scientific practice of medicine and has earned enduring fame.

A NEGLECTED SUBJECT.

AMONG the many reforms relating to human health and comfort, comparatively little effective work has been done in correcting unreasonable adoption of fashions in the use of wearing apparel. The papers quite frequently devote space to witty criticisms of women's dress, but men must acknowledge that there is abundant reason for suspicion that the arrangement of the male attire might be modified to advantage. Women do not wear so many superfluous garments as men, and the question is often raised as to the significance of the greater weight of men's clothing. Very few men would be comfortable in a temperate climate in winter with the weight of clothing which women wear, but there has been no concerted movement to have women dress warmer or men dispense with some of the layers of woollen garments. It is probable that if boys and girls were dressed with about the same weight of clothing and this ratio maintained through life, both would be equally comfortable; and

since women do not suffer from cold any more than men, one wonders why men adopt the heavier clothing.

Although the average weight of a woman's clothes is five and a man's nine pounds, this difference is not explained in the relative size of the sexes. If men do not need more clothes than women, why not begin with the boy and keep him down to reasonable requirements? Some writers are contending that the heavier clothing of men is a distinct menace in warm weather, and that the result is depressing and, in some instances, adds an element of danger. The reports of heat exhaustion in summer seem to indicate that men are the victims more often than women.

We change our habits slowly, and it may be a long time before the high neckwear is displaced by simpler and more hygienic devices, and the heavier underwear and outside coats give way to lighter fabrics. The matter is of sufficient importance to warrant more definite advice from physicians.

AN APPEAL OF A QUACK TO POSSIBLE QUACKS.

A CIRCULAR has been sent to physicians in this vicinity, setting forth that a Dr. Gregory taught a special post-graduate course in Boston last year and that "several" have written requesting his return. He has "consented" to conduct another class in April. This class is for regular physicians. The course is guaranteed to be "far superior to the chiro-quack-tic system" in that three treatments as set forth by Dr. Gregory are better than ten of the other kind. The diseases cured by this method are named, and cover most of the incurables and some troubles for which surgery is the accepted therapeutic agent. It is claimed that one can, by the methods taught, even learn how to restore heart action after it has stopped.

Why do we have medical schools and hospitals, with all the expensive equipment and faithful service of able men, if this wonderful system makes them unnecessary? The JOURNAL suggests that information relating to attendance upon this course by any physician in good standing be furnished. It would be interesting to know if there are practitioners among us who are supposed to be decent, but who are really fools.

A prominent physician asks if any official body has any control over "these cattle." Unfortunately, no board has such authority. A victim might sue under the contention that money had been obtained under false representation. If anybody attends the course, there will be confirmation of Barnum's famous saying.

NEWS ITEMS.

NORFOLK DISTRICT MEDICAL SOCIETY.—A meeting of the Norfolk District Medical Society was held at the Masonic Temple in Roxbury on March 28, 1922. Dr. C. D. Knowlton presided. A most interesting paper was read by Dr. Paul D. White on "The Failing Heart." He differentiated the congestive from the an-ginal type, and then in a most enlightening way expressed his views on the action of digitalis compounds. Certain varieties of the American powdered leaves are, perhaps, the most active of any available, and should, of course, be first tested out on frogs, and used clinically in much larger doses than is usually done.

Dr. Robey and Dr. Pratt, in discussing the paper, praised it highly, laying special emphasis on the exceptionally fine work done in Dr. White's clinic at the Massachusetts General Hospital.

JOSEPH I. GROVER, M.D.

RESTORATION TO PRACTICE.—Eldredge D. Atwood, the osteopathic physician who shot and killed another member of the cult a few years ago, has been reinstated as a practitioner of medicine in this Commonwealth, by the Board of Registration in Medicine.

EXAMINATION OF APPLICANTS TO PRACTISE MEDICINE.—Forty applicants were examined by the Board of Registration, March 14, 15, 16, 1922. Twenty-four secured registration, fifteen were rejected, and the decision postponed in one case.

BOSTON MEDICAL LIBRARY IN CONJUNCTION WITH THE SUFFOLK MEDICAL SOCIETY.—A meeting of the Medical Section was held March 29 1922. Dr. Francis G. Blake, Professor of Medicine, Yale Medical School, spoke on "Recent Investigations in Measles." The subject was discussed by Drs. E. H. Place and R. M. Smith.

GRANTS TO THE AMERICAN SOCIETY FOR THE CONTROL OF CANCER.—The Society has received the following gifts: From the family of Mrs. M. Larker of New York City, \$50,000 in memory of her son, who died of cancer. The income will be applied to the production and distribution of educational material;

The Commonwealth Fund of New York City has given \$26,750. This sum will make it possible to employ a full-time field organizer and provide office equipment; also newspaper publicity and the distribution of educational material;

The Laura Spelman Rockefeller Memorial granted to the Society \$8,000 for the production of motion picture films.

These endowments and grants will provide for a larger educational campaign. It is expected that a Cancer Week program for next autumn will be announced later.

DEATH RATE IN BOSTON.—During the week ending April 1, 1922, the number of deaths reported was 237 against 228 last year, with a rate of 16.18. There were 35 deaths under one year of age against 36 last year.

The number of cases of principal reportable diseases were: Diphtheria, 47; scarlet fever, 40; measles, 185; whooping-cough, 6; typhoid fever, 1; tuberculosis, 49.

Included in the above, were the following cases of non-residents: Diphtheria, 1; scarlet fever, 11; tuberculosis, 7.

Total deaths from these diseases were: Diphtheria, 1; scarlet fever, 1.

LEGISLATIVE MATTERS.

House 98.—Bill relative to the names under which dentists may practise and to continuing the business of incapacitated or deceased practitioners. Reported ought *not* to pass by the Committee on Public Health, and placed in the Orders of the Day for next session.

House 750.—See House 1454 for report.

House 1454.—Resolve providing for an investigation by the Department of Public Health as to the feasibility of establishing hospitals for the treatment of surgical and non-pulmonary tuberculosis. New draft of House Bill 750 reported by the Committee on House Ways and Means and placed in the Orders of the Day for next session.

House 60.—Bill relieving druggists and others from advertising applications for licenses for the sale of liquors. House concurs in Senate amendment.

House 598.—Bill to provide for the registration of medical students for the limited practice of medicine. Ordered to a Third Reading by House.

House 747.—Resolve to prevent the introduction and spread of bubonic plague. Reported in House, reference to next annual session, by the Committee on Public Health, and placed in the Orders of the Day for next session.

House 1454.—See House 1484 for report.

House 1484.—Resolve providing for an investigation by the Department of Public Health of the feasibility of providing additional facilities for the treatment of surgical or non-pulmonary tuberculosis. New draft of House 1454, ordered to a Third Reading by House.

The bill providing for requiring vaccination of pupils in private schools has been defeated in the House.

House 1484.—Resolve providing for an investigation by the Department of Public Health as to the feasibility of providing additional facilities for the treatment of surgical or non-pulmonary tuberculosis. Passed to be engrossed by the House. Sent up for concurrence.

The Federal Maternity Act.—The United States Children's Bureau states that 36 states have signified acceptance of this Act. In eight States acceptance was by act of legislature, and in the others through proclamation of the Governor. The States which have not yet accepted the Act are: California, Louisiana, Maine, Maryland, Massachusetts, Washington, Mississippi, Nevada, New York, Rhode Island and Tennessee.

New York passed a bill on March 17, which provides \$130,000 for the protection of the health of mothers, infants, and children. The State Department of Health will administer the provisions of the Act, through a Division of Maternity, Infancy and Child Hygiene. Kentucky has passed a chiropractic bill which provides for a State Board of Examiners.

Miscellany.

A NEW PRISON.

THE State of Massachusetts has been considering the necessity of erecting a prison to take the place of the old building in Charlestown. Dr. Beverley Robinson has recently written on the care of prisoners. This may interest some physicians, and is here reproduced from the *New York Evening Post*. He says:

"All prisoners should have discipline, as in the Army or Navy, but no cruelty and no coddling. They should have comfortable cells, proper toilet facilities, good food, sufficient exercise, healthful, occasional distractions, such as games or instructive, elevating shows, but above all, plenty of work, with the best tools, and proper, just compensation, pecuniarily, for their work, from which should be deducted enough to pay the State for their keep and to give a large proportion of what is over and above for the help or maintenance of wife or children. In all cases, enough money should be given the prisoner when he has served his time to enable him to go into the world again and get work, away from his former pals and the neighborhood where he committed his crime.

"Every man should be taught a trade in the best possible way, so that he could make a living or secure a position without the necessity of a personal recommendation. All informers upon a man, who has been a convict and who is trying to reestablish himself as a good citi-

zen, should be dealt with severely. These are usually blackmailers and are, in my estimation, of the lowest kind. Another thing—and this is most important: all householders should have permission to have firearms, and it should be known that they are prepared and able to protect themselves in their homes and wherever they are exposed to attack by gangsters.

"The foregoing is not idle talk, but firm and reasoned conviction, after many years of knowledge of and contact with criminals. Women, and indeed men, are well protected by carrying and using, if threatened or legitimately suspicious, a watchman's whistle. A woman has also a great protection in the use of her hatpin. This is more dreaded even than a pistol, by hold-up men."

NEGRO HEALTH WEEK.

THE keynote of National Negro Health Week, April 2 to 8, will, this year be that the negro death rate, as shown by the census returns, is not only not increasing, but is steadily decreasing, and, moreover, is no higher today than that of New York and Boston was forty years ago, and is only about two-thirds as high as that of Trieste, Petrograd, Montreal, Venice, and other cities at that time.

From this it will be argued that American negroes are not necessarily short-lived, or especially liable to disease, and that their death rate is high because of their comparative poverty. Everywhere the colored people will be told to look after their health, that they are not doomed by Nature to an early grave, but that by care they can avoid many of the ills that lie in wait for them, and prolong life for many years. In the last eight years the death rate of the negro policy holders in one of the great New York life insurance companies has been reduced 9 per cent.

This year's health week, the eighth to be held, was conducted by Dr. R. R. Moton, Principal of Tuskegee Institute, under the auspices of the Annual Tuskegee Negro Conference and the National Negro Business League in coöperation with the U. S. Public Health Service and many other associations.

THE Cancer Research Fund (Ireland) has been founded by the Managing Committee of the City of Dublin Skin and Cancer Hospital, and the said fund is under the auspices and control of this Hospital. The Research Department will be built as an annex to the City of Dublin Skin and Cancer Hospital, in which ample clinical material is available for research. —*Medical Press and Circular.*

NATIONAL HOSPITAL DAY.

THE U. S. Public Health Service found the celebration of National Hospital Day so popular and so generally satisfactory last year that it heartily approves its repetition this year, on Friday, May 12, the anniversary of the birth of Florence Nightingale, founder of modern nursing. On that day, the public will be again invited to visit the hospitals in their vicinity as guests and to familiarize themselves with their atmosphere, methods, and aims.

Last year, Surgeon-General Cumming, of the Public Health Service, in accepting for the Service hospitals the invitation to join in the observance of the day, took as a text the existing scarcity of hospitals and the great difficulty everywhere met of finding hospitals, or even buildings that were capable of being converted into hospitals. During the year, much progress has been made in solving the hospital question, and the Surgeon-General bases his acceptance on the great work which the hospitals are doing in the war against disease.

In writing to Mr. M. O. Foley of Chicago, secretary of the National Hospital Day Committee, he brings out the following points:

"Familiarity with hospital work is rapidly becoming of more importance than was foreseen a year ago. It is apparent that the great war to be waged during the next half century is to be one to eradicate disease, to conserve health, and to lengthen life.

"This war has, indeed, already been begun and has not a few triumphs to its credit. Some of these are well reflected in the annual death rate in the United States, which during the last twenty years has dropped, per hundred thousand of the population; for typhoid fever, from 35.9 to 9.2; for measles, from 12.5 to 3.9; for scarlet fever, from 10.2 to 2.8; for diphtheria, from 43.3 to 14.7; for tuberculosis, from 201.9 to 125.6; for pneumonia, from 180.5 to 123.6; and for all causes, from 1,755 to 1,288. Incidentally, yellow fever has been eradicated and smallpox, plague, and typhus are held at bay.

"The hospital, of course, did not bring about these great life-saving reductions by its sole efforts. But it did, and does, begin the modern attack—the first really efficient attack—on nearly every disease of importance. In its wards and its laboratories, it has fought for the lives of its patients, and it has also taught and trained, and provided the weapons for those who later went to take up the fight.

"Looked at in this way, every hospital has become a fortress in a war waged for the health of the people and must more and more lead in the instruction of the people. A hospital is a great human laboratory where disease is studied and where soldiers are trained to save and to prolong life."

The Massachusetts Medical Society.

MEMBERSHIP CHANGES FOR THE MONTH OF MARCH, 1922.

Official List (2d).

Compiled by the Secretary of the Society.

Armstrong, Donald Budd, from Framingham to New York City, 370 Seventh Ave.
 Avedisyan, Avedis Der, from Boston to Brighton, office, Boston, 438 Columbus Ave.
 Bicknell, Ralph Emerson, Lynn, now 79 Barrill St.
 Blood, George Willard, Fall River, now 122 Purchase St.
 Boutwell, Horace Keith, Brookline, now 15 Green St.
 Bowen, James Francis, St. Louis, Mo., now U. S. V. Hospital No. 35, 5900 Arsenal St.
 Brown, Arthur Aloysius, from Worcester to Millbury, 7 South Main St.
 Brown, William James, from Boston to Cambridge, 881 Massachusetts Ave.
 Butler, Alice Etta, Boston, from 57 Cambridge St. to 201 Clarendon St.
 Camfill, Robert Emmett, Springfield, now 172 Chestnut St.
 Carlton, Frank Carr, from Salem to Fall River, 324 East Main St.
 Cassidy, Franklin Chester, from Medford to Chicago, 5311 Kenwood Ave.
 Chaffin, George Lawrence, Los Angeles, Calif., from Kerchoff Building to 706 Pacific Mutual Building.
 Chandler, Norman Fitch, died at Medford, March 6, aged 62.
 Chase, Heman Baker, from Hyannis to Westfield State Sanatorium.
 Cook, James Henry, from Braintree to Quincy, 138 Franklin St.
 Cruff, Frederick Ellery, from West Roxbury to Brighton, 296 Allston St.
 Cunningham, Thomas Donald, Denver, Colo., now 1068 Harrison St.
 Curtis, Charles Leverett, Salem, now 101 Federal St.
 Desmond, Margaret Ellen, from Boston to Beverly, 124 Rantoul St.
 Dodd, Isaac Spencer Finney, Pittsfield, now 34 Penn St.
 Elliot, Martha May, now Boston; office, New Haven, Conn., New Haven Hospital.
 Emery, Edward Stanley, Jr., from Roxbury to Brookline, 46 Hyslop Road.
 Fales, Alonzo Cartland, now Middleton, Annapolis County, Nova Scotia.
 Fitz, Reginald, now Mayo Clinic, Rochester, Minn.
 Fox, Michael Bernard, now Worcester, 300 Main St.
 Fraser, Archibald McKay, Boston, now 270 Commonwealth Ave.
 Fremont-Smith, Maurice, Boston, now 205 Beacon St.
 Gangemi, Michael Angelo, North Adams, now 98 Summer St.
 Giddings, Harold Girard, from Allston to Newton Center; office, Boston, 520 Commonwealth Ave.
 Graves, William Phillips, Boston, now 198 Commonwealth Ave.
 Grimes, Loring, Lynn, now 84 Humphrey St.
 Gwynne, Samuel Carlton, Medical Corps, United States Army.
 Harding, Edward, Boston, now 520 Commonwealth Ave.
 Hayes, William Francis, Beverly, now 376 Cabot St.
 Haywood, Ralph Winsor, from Boston to Salem, 2 Columbus Ave.
 Hennessey, Thomas Francis, Lynn, now 658A Western Ave.

Holmberg, Carl Lester Magnus, from Campello to Woonsocket, R. I.
 Howard, Frederick Hollis, Williamstown, now Post-office Building, Spring St.
 Hurley, William Cyril Rowe, Quincy, now 1173 Hancock St.
 Irving, Frederic Carpenter. Delete "Brookline office." He was transferred from Norfolk to Suffolk, Feb. 7, 1917. Now Boston, 443 Beacon St.
 Johnson, Peer Prescott, Beverly, now 163 Cabot St.
 Jones, Frank Leslie, from West Somerville to Somerville, 281 Broadway.
 Jones, Lyman Asa, Swampscott, 60 Humphrey St.
 Jones, William Marks, Lowell, now 290 Branch St.
 Keith, Wallace Cushing, Brockton, now 46 West Rosseter St.
 Killam, Franklin Harrison, from Mountain View, N. H., to Brownville, Me.
 Kirkpatrick, George Holland, Lynn, now 203 Lewis St.
 Kotler, Moses George, from Brockton to Malden, 238 Bryant St.
 La Liberté, Elie Joseph, Fall River, now 422 North Main St.
 Leslie, Charles Thomas, Pittsfield, now Bank Row.
 Liebman, William, from Brookline to Hartford, Conn., 179 Kenyon St.
 Lowd, Harry Mosher, Swampscott, 80 Burrill St.
 Lucy, John Joseph, from Brighton to Watertown; office, Boston, 20 Charlesgate West.
 MacArthur, George Elden, Ipswich, now 21 North Main St.
 Mather, John Adams, from Colrain to Greenfield, 191 Main St.
 Maxwell, Charles James, Hinsdale, now Plunkett Ave.
 May, George Elisha, from Waban to Newton Center; office, Boston, 353 Commonwealth Ave.
 McCarty, Edward Michael, Somerville, now 60 College Ave.
 McCarty, James Joseph, Minneapolis, Minn., 4915 Dupont Ave., South.
 Mann, David Edwin, from Rutland to Johnson City, Tenn., Nat'l Sanatorium.
 Means, James Howard, Boston, now Massachusetts General Hospital.
 Mernin, Mary Fowler, now Ellis Island, N. Y., U. S. Public Health Service.
 Moir, Marguerite Winifred, from Brookline to West Roxbury, 539 Weld St.
 Nielsen, Edwin Björne, from Brookline to Newton Center; office, Boston, 543 Boylston St.
 O'Brien, Carl Robert, Bangor, Me., now 49 Hammond St.
 Odeneal, Thomas Helm, from Ancon, Panama, to Beverly 163 Cabot St.
 Parcher, George Clarence, Saugus, now 38 Main St.
 Peabody, Francis Weld, Boston, now Boston City Hospital.
 Perry, Martha, New Bedford, now 166 Campbell St.
 Rice, Austin Bradford, local list, Fiskdale. Delete name.
 Rich, Charles Edwin, Lynn, now 65 Broad St.
 Riley, Charles Allen, now Allston (Boston), 1277 Commonwealth Ave.
 Roney, Hugh Beverly, Pittsfield, now 60 Federal St.
 Rushford, Edward Allan, Salem, change from 76 to 78 Essex St.
 Shannon, Nat Vaughan, Cambridge, now 7 Clinton St.
 Shattwell, James Arthur, Beverly, now 15 Thordike St.
 Sisco, Dwight Lewis, from Manitou, Colo., to New York City, Rockefeller International Health Board, 61 Broadway.
 Slickney, George Augustus, Beverly, now 68 Lothrop St.
 Stillman, Raymond Durgin, from Worcester to Wareham, Center St.

Vrooman, Earle Morey, North Adams, now 85 Main St.
 White, George Arthur, Cambridge, now 863 Massachusetts Ave.
 White, John Robert, from Washington, D. C., to Oakland, Calif.; office, San Francisco, U. S. Naval Training Station.
 Whiteside, George Shattuck, Portland, Ore., now 904 Journal Building.
 Whitman, Luther Oakes, from Amherst to Northampton, 203 Bridge St.
 Wood, Nelson Merwin, from Charlestown to Brookline; office, Boston, 510 Commonwealth Ave.
 Young, Edward Lorraine, Jr. Delete "Jamaica Plain (Boston)." He was transferred from Norfolk to Suffolk, June 9, 1914. Now Boston, 279 Clarendon St.

WANTED

Addresses of
 Azadian, David George
 Bardwell, Frederick Albert
 Bolduc, Alfred George
 Lawlor, John Charles

Changes of address should be sent to the Secretary, Dr. Walter L. Burrage, 42 Eliot St., Jamaica Plain.

Correspondence.

CERTIFICATE OF REGISTRATION STOLEN.

Mr. Editor:

We are in receipt of a letter from Dr. John A. Sullivan, 73 North Street, Pittsfield, Mass., in which he reports that his certificate of registration as a practitioner of medicine in this Commonwealth was stolen from his office on April 1, 1922. Perhaps publication of this notification in your JOURNAL might prevent the thief from engaging in practice in another section of this State, or in some other State.

Dr. Sullivan reports that he has notified the local police, but he does not inform us whether he has any clue as to the person who stole the certificate.

Very truly yours,

SAMUEL H. CALDERWOOD, M.D., Secretary.

THE MIDWIFE BILL.

Mr. Editor:

Your commentator, who, in the issue of March 23, expressed himself on the Midwife Bill, indulging in the hypothesis that a favorable recommendation would be due to the influence of the medical profession in Springfield, propounded, rather loftily, a double question, the first half of which contains an inference partially incorrect, and the second half an inference wholly so. Then, for the elation of knocking it down, he sets up a straw man in the statement, which nobody questions, that a well trained nurse is better qualified than a midwife to conduct obstetrics.

To recapitulate, by way of response: No physician in Springfield wants inadequately educated midwives—or any sort of midwives, for that matter; they recognize a fact, and try to make the best of it. People who have grown up where the *sage-femme* or the *herbwoman* is a recognized institution seem to want a midwife here; if so, better a licensed than an unlicensed one. No one here has any inclination to restrain a well-educated nurse from being a midwife if she wants to—in fact, we should like to see one who would do a fraction of the varied work that a midwife does, even with the promise of a bonus bill.

PHILIP KILBOT.

STATE OF NEW YORK—THE CIVIL SERVICE COMMISSION.

EXAMINATIONS APRIL 29, 1922.

Application forms for written examinations may not be sent out by mail after April 17, and may not be accepted after April 19. Application forms for unwritten examinations may not be sent out by mail after April 27, and may not be accepted after April 29.

109. Chief Occupational Therapist, State Hospital Commission. \$1200 to \$1320 and maintenance. Six appointments expected. The duties include the supervision of the treatment of mental patients by means of occupational therapy and the instruction and direction of nurses in occupational therapy. Appointments may also be made from this list to the position of Occupational Therapist in State and County institutions. Candidates must have had special training in occupational therapy and experience in the treatment of mental patients by means of occupational therapy. Subjects of examination: Written examination relating to occupational therapy, relative weight 3; training, experience and general qualifications, relative weight 7. An interview may be required. Open to non-residents.

115. Laboratory Apprentice, Division of Laboratories and Research, State Department of Health, \$940 to \$1020. Minimum age 18 years. Candidates must be college graduates or have had equivalent training or experience in physics and chemistry. Students who expect to graduate in June will be admitted. A general knowledge of bacteriology and practical laboratory experience is desirable but not essential. Subjects of examination: Written examination on physics and chemistry, relative weight 5; education and experience, relative weight 5. Open to non-residents and non-citizens.

For application form, address a postal card to State Civil Service Commission, Albany, N. Y.

NOTICES.

RESEARCH CLUB OF THE HARVARD MEDICAL SCHOOL.—At the next meeting to be held on April 14th, in the Amphitheatre of Building A, at 12.30 o'clock, Dr. W. R. Miles will talk on "Psychomotor Effects of Dilute Alcohol Compared with Concentration in the Urine."

BOSTON CITY HOSPITAL.—Staff Clinical Meeting, Cheever Surgical Amphitheatre. Friday, April 14, 1922, at 7.45 P. M. Symposium under the direction of the Heart Service of the Boston City Hospital. Diagnostic Analysis of 300 Heart Cases in the Out-Patient Department, Burton E. Hamilton. Lantern slide demonstration on some points of heart disease, William D. Reid. Failure of the Chronic Heart with and without Physical Signs, William H. Robey. Some Notes on the Action of Digitalis, Thomas J. O'Brien. Refreshments served. Open discussion. Physicians and medical students invited. H. Archibald Nissen, Halsey B. Loder, Committee.

CENSORS' MEETING.—The Censors of the Suffolk District Medical Society will meet for the examination of candidates at the Medical Library, No. 8 The Fenway, Thursday, May 4, 1922, at 4 o'clock. Candidates should make personal application to the Secretary, and present their medical diploma at least one week before the examination. Richard H. Miller, Secretary, 402 Marlborough St., Boston.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY.—A special meeting of the New England Ophthalmological Society will be held at the Massachusetts Charitable Eye and Ear Infirmary, 233 Charles street, Boston, on Friday evening, April 14, at 8 o'clock. Professor Barraquer, Colonel Elliot and Dr. McReynolds will be guests of the society at this meeting. At the latest meeting, in March, it was voted that Article 3 of the constitution should be amended to read as stated in the previous call. Dr. McReynolds and Colonel Elliot will address the society on the subjects of Cataract Extraction and Glaucoma. Operative clinics will be held at the Massachusetts Charitable Eye and Ear Infirmary on the mornings of April 14 and 15, at which Professor Barraquer will demonstrate his method of intracapsular extraction. It is expected also that Colonel Elliot will demonstrate his method of trephining for glaucoma. It is hoped that all members of the society will make an effort to avail themselves of the exceptional opportunity to see these operations.

W. HOLBROOK LOWELL, Secretary.

CHILDREN'S HOSPITAL.—There will be a clinical meeting in the Amphitheatre of the Children's Hospital, 300 Longwood Ave., Boston, at 4.30 o'clock, April 14. Physicians and medical students are cordially invited to attend.

NEW ENGLAND PEDIATRIC SOCIETY.—The seventy-fourth meeting of the New England Pediatric Society will be held at the Boston Medical Library on Friday, April 14, 1922. The following papers will be read: Treatment of Asthma and Associated Diseases in Childhood, Allan R. Cunningham, M.D., Boston. Leukemia and Severe Anemia in Childhood: A Study of Thirty-Seven Cases, John Lovett Morse, M.D., Boston; Bone Tuberculosis in Childhood (with lantern slides), Frank R. Obert, M.D., Boston. Light refreshments will be served after the meeting. Richard M. Smith, M.D., President; Lewis Webb Hill, M.D., Secretary.

NATIONAL BOARD OF MEDICAL EXAMINERS.

The dates for the next two examinations of the National Board of Medical Examiners are as follows: Part I and II, June 19, 20, 21, 22, and 23, 1922. Part I and II, September 25, 26, 27, 28, and 29, 1922. Applications for the June examination should be in the Secretary's office not later than May 15th, and for the September examination not later than June 1st. Application blanks and circulars of information may be had by writing to the Secretary, Dr. J. S. Rodman, 1310 Medical Arts Building, Philadelphia.

BOOKS FOR REVIEW.

THE JOURNAL acknowledges the receipt of the following books for review:

The Etiology and Pathology of Typhus. By S. Burt Wolbach, John L. Todd and Francis W. Palfrey. Published by League of Red Cross Societies at the Harvard University Press, Cambridge, Mass. 222 pages. 34 plates.

Book on the Physician Himself. By D. W. Cathell. Published by the Author, Baltimore, Md. 350 pages.

The Psychic Health of Jesus. By Walter E. Bundy. Published by The Macmillan Co., New York. 290 pages. Price \$3.

An Index of Treatment. By various writers. Published by William Wood & Co., New York. 1029 pages.